This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.
+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.
+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.
+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

~~Ref 138.20~~
KF.20586(2)

O.

Harvard College Library

FROM THE FUND OF

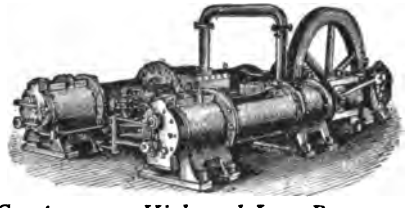
CHARLES MINOT

(Class of 1828).

Received 22 June, 1893. N.

RAND DRILL CO.

ROCK DRILLS,
AIR COMPRESSORS,
MINING MACHINERY.



Air Compressors: — *Compressors, High and Low Pressure, for Air, Gas, Liquids, etc., with Compound Air and Steam Cylinders, Corliss or Meyer Steam Valves, New Improved Mechanical Air Valves.*

RAND DRILL CO., 23 Park Place, New York City, U.S.A.

BRANCH OFFICES: — Monadnock Building, Chicago, Ill.; Ishpeming, Mich.; 1316 Eighteenth Street, Denver, Colo.; Sherbrooke, P.Q., Canada. Apartado 830, City of Mexico.

D'ESTE & SEELEY CO.

Manufacturers of the

CURTIS ENGINEERING SPECIALTIES.

.. **Pressure Regulators, Separators, Steam Traps, Damper Regulators, Pump Regulators, Return Traps, and a Full Line of Sanitary Appliances.**

29 to 33 Haverhill Street, Boston.

THE

Coles Flue Expander

and Beader Machine

For Expanding and Beading Boiler Tubes, is the Best Tool of the Kind on the Market.

It will make a perfectly tight joint, and may be used with perfect safety when steam is on the boiler.

A single trial will convince any one of its great value for this purpose.

THE COLES FLUE EXPANDER AND BEADER CO.

Hartford, ... Conn.

GALLOUPE'S GENERAL INDEX

TO

Engineering Periodicals,

FROM **1888** TO **1892**, INCLUSIVE.

COMPRISING

ENGINEERING; RAILROADS; SCIENCE; MANUFACTURES AND TRADE.

BY

FRANCIS E. GALLOUPE, M.E.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY, S.B.; MEMBER AMERICAN SOCIETY OF MECHANICAL ENGINEERS, ETC.

VOLUME II.

BOSTON:
30 KILBY STREET.
1893.

~~JR 3.98~~
~~RR 110.7~~
~~Ref 138.20~~
KF20586 (2)
HARVARD COLLEGE
JUN 22 1893
LIBRARY.
Minot fund.

COPYRIGHT, 1893, BY
FRANCIS E. GALLOUPE,.
BOSTON, MASS.
(*All rights reserved.*)

THE NICHOLS PRESS:
THOS. P. NICHOLS, LYNN, MASS.

FROM THE PREFACE TO THE FIRST VOLUME.

PROGRESS in the development of material resources, in recent years, has created a large and increasing volume of engineering literature in periodicals which contain valuable papers and information, much of which is too recent, or fragmentary in character, to be found in books, or elsewhere.

This work is designed to make accessible to engineers in all branches of the profession, to special investigators, librarians, editors and others, the more important papers and articles contained in leading American and English periodicals during the last five years. To keep the list from becoming unwieldy, it was decided to limit, besides the period covered, the number of periodicals, and with these restrictions the compiler has selected each reference given by personal examination of the articles in the files.

The index is by subjects, alphabetically arranged, and makes available information now practically buried in the mass of engineering literature, or only to be extracted by the aid of some one hundred and fifty indices, and the loss of much time.

BOSTON, *May*, 1888.

HARVARD COLLEGE
JUN 22 1893
LIBRARY.

PREFACE.

THE purpose of this Index is to supply a reference list to the important works and matters relating to engineering and its allied interests, during the period covered. It is believed that no other index fills the field of this work, which shows at a glance the principal information published on any given subject in the leading periodicals during the past five years. The periodicals indexed having been selected from a list of over one hundred and sixty periodicals will, it is thought, sufficiently cover the field of practical engineering, as nearly all important works and matters are contained among these representative papers. Foreign papers are represented by translated articles reprinted in the periodicals indexed, and there are besides incidental references to numerous others.

Within the limits set, the aim has been, by a critical examination of each article throughout the files, to preserve references to all those of permanent technical value, or practical use.

BOSTON, *June*, 1893.

ABBREVIATIONS.

addr. address.
agric. agricultural.
Am. American.
amt. amount.
anal. analysis.
ap. apparatus.
aqued. aqueduct.
atmos. atmosphere.
aut. automatic.
bat. battery.
Bess. Bessemer.
Brit. British.
bull. bulletin.
cal. calculating, calculation.
capac. capacity.
cath. cathedral.
C. E. civil engineer.
Cens. Census.
centrif. centrifugal.
chem. chemistry.
condens. condensing, condensation.
cor. correspondence
corrug. corrugated.
Corp. Corporation.
Co's. Companies.
cyl. cylinder.
dec. decrease.
dept. department.
des. designer, design.
desc. description.
diam. diameter.
discov. discovery.
discuss. discussion.
distil. distillation.
distrib. distribution.
dyn. dynamometer.
econ. economy, economical.
effic. efficiency.
elec. electric.
eng. engineering.
es. estimate.
estab. establishment.
evap. evaporation.
exam. examination.
excav. excavating, excavation.
exhib. exhibition.
exp. expense.
expt. experiment.
frt. freight.
galv. galvanometer.
gov. governor.
h. house.
h. p. horse power.
hist. history.
hor. horizontal.
hos. hospital.
ht. height.
hydr. hydraulic.
illum. illuminating.
imp. improvement.
inc. increase.
incand. incandescent.
indus. industry, industrial.

ins. insurance.
Inst. Institute.
inv. inventor, invention.
locom. locomotive.
M. E. mechanical engineer.
mach. machine, machinery.
manuf. manufacture.
max. maximum.
min. minute.
mo. motive.
mt. mountain.
munic. municipal.
mut. mutual.
n. note.
nav. navigation.
obs. observations.
pass. passenger.
pat. patent.
pneu. pneumatic.
pop. population.
por. portrait.
pph. pamphlet.
pro. proceedings.
proc. process.
prog. progress.
pyrom. pyrometer.
R. railroad.
recip. reciprocating.
refrig. refrigerating.
rep. report.
resist. resistance.
Ry. railway.
san. sanitary.
sec. second.
Soc. Society.
spec. specification.
sq. square.
st. street.
stat. statistics.
str. steamer.
sup. supplement.
teleg. telegraph.
teleph. telephone.
temp. temperature.
topog. topographical.
util. utilization.
vac. vacuum.
vel. velocity.
ventil. ventilation.
wrt. wrought.
wt. weight.

NAMES OF PERIODICALS INDEXED,

WITH THEIR ABBREVIATIONS.

Cassier's Magazine. *Cassier's*
Electrical Engineer, N. Y. *El Eng*
Electrical Review, London. *El Rev Lond*
Electrical Review, N. Y. *El Rev*
Electrical World, N. Y. *El Wld*
Engineer, The, London. *The Eng*
Engineering, London. *Eng*
Engineering Magazine, N. Y. *E Mag*
Engineering and Mining Journal, N. Y. *E & Min*
Engineering News, N. Y. *E News*
Engineering Record, N. Y. *E Rec*
Journal of the Franklin Institute, Phila. *F Inst*
Power, N. Y. *Pwr*
Proceedings of the Institution of Civil Engineers, London. *Inst C E*
Proceedings of the Institution of Mechanical Engineers, London. *Inst M E*
Proceedings of the Society of Arts, Boston. *Soc Arts Mass*
Railroad and Engineering Journal, N. Y. *R & Eng*
Railroad Gazette, N. Y. *R Gaz*
Scientific American Supplement, N. Y. *Sc Am Sup*
Street Railway Journal, N. Y. *St R J*
Technology Quarterly, Boston. *Tech Q*
Transactions American Institute of Mining Engineers, N. Y. *Am Min*
Transactions American Society of Civil Engineers, N. Y. *Am C E*
Transactions American Society of Mechanical Engineers, N. Y. *Am M E*

OTHER PERIODICALS INCIDENTALLY INDEXED IN PART.

American Engineer; Annales des Ponts; Building News, London; Century Magazine; Cosmopolitan Magazine; Forum; Le Genie Civil; Harper's Monthly; Industries; Iron Age; Journal of the Assoc. of Eng. Societies; The Locomotive; New England Magazine; Nineteenth Century; North American Review; Scribner's Magazine, etc.

PRINCIPAL SUBJECTS

INCLUDED IN THE INDEX.

PAGE

Agriculture 1
Air 2
Air navigation 3
Alloys 4
Aluminum 5
Arches 8
Architecture 9
Astronomy 12

Beams and girders 15
Belts 16
Blast furnaces 17
Blowers and fans 19
Blue print processes 20
Boilers 20
Brick 27
Bridges 27
Buildings and building . . . 45

Cable railroads 50
Canals 53
Capital and labor 57
Cars and carriages 57
Cast iron 65
Cements and mortars 66
Chemistry 69
Chimneys 73
Cities 74
Coal 75
Columns 79
Copper 81
Cranes and derricks 84
Crossties 85

Dams 87
Docks 91
Drainage 92
Drawing 93
Dredgers 93

PAGE

Dynamometers 95
Dynamos 95

Education 100
Electric engineering 101
Electric batteries 102
Electric companies 103
Electric conductors 105
Electric currents 105
Electric distribution 109
Electric engineers 110
Electric generators 111
Electric heating 112
Electric induction 113
Electric insulation 114
Electric lamps, arc 115
Electric lamps, incand. 115
Electric lighting 116
Electric lighting stations . . 121
Electric meters 124
Electric motors 125
Electric power 128
Electric power transmission 129
Electric resistance 130
Electric transformers 133
Electric units 134
Electric welding 135
Electric wires 137
Electricity 138
Elevators 141
Engineering 143
Engineering, civil 144
Engineering, mechanical . 144
Engineers 145
Engines 147
Engines, tests 153
Excavating 155
Exhibitions 155
Explosives 157

PAGE

Ferry-boats 159
Fire protection 161
Flying 163
Foundations 164
Foundry 165
Friction 166
Fuels 166
Furnaces 167

Gas 169
Gas engines 169
Gearing 172
Gold 174
Great Britain 177
Gunnery and armor 178
Guns 179

Harbor engineering 182
Heat 187
Heating and ventilation . . . 188
Hoisting 189
Hydraulic engineering 191

Indexes 192
Instruments 194
Inventions 194
Iron and steel 195
Irrigation 200

Labor 203
Lakes 204
Light 207
Light-houses 208
Lightning 209
Locomotives 210
Lubrication 226

Machine 226
Magnetism 227
Maps 229
Marine engineering 229
Marine boilers 229
Marine engines 231
Materials 235
Metals 237
Metallurgy 237
Military engineering 239
Mills and factories 240
Minerals 240
Mines and mining eng. . . . 241

PAGE

Mining engineers 245
Municipal engineering 247

Navies 248
New York city 252
Niagara Falls 253
Nickel 253

Oils 254
Ore 255

Paper 257
Patents 258
Pavements 258
Petroleum 260
Petrol. engines 261
Phonograph 262
Phosphates 262
Photography 262
Physics 264
Piles 265
Pipes 266
Plumbing 267
Power transmission 268
Pumping engines 270
Pumps 272

Quarrying 273

Railroads 274
Railroad accidents 275
Railroad brakes 278
Railroad construction 281
Railroad curves 282
Railroads, electric 283
Railroads, electric motors . . 289
R's. electric, power stations 289
Railroads, elevated 291
Railroad location 296
Railroads, mountain 297
Railroad signals 303
Railroad speeds 305
Railroad stations 306
Railroad switches 308
Railroad train resistance . . 310
Railroads, underground . . . 311
Railroads, U. S. 312
Rails 313
Rail joints 315
Rail sections 315

PAGE
Rainfall 316
Rapid transit 317
Refrigerating 318
Reservoirs 318
Rivers 320
Roads 323
Roofs 325
Rope driving 326
Rotary engines 326

Sanitary engineering 328
Schools 328
Science 329
Screw propellers 329
Sewerage 330
Ship-building 335
Ships 335
Silver 336
Smoke prevention 338
Standpipes 341
Steam 341
Steam heating 343
Steam pipes 344
Steamers 345
Steel 348
Stone 351
Storage batteries 351
Street railroads 353
St. railroads motive power . 355
Streets 356
Sugar 357
Sun 358
Surveying 358

PAGE
Telegraph 360
Telephone 363
Telpherage 365
Testing 366
Timber 367
Time 368
Tin 368
Torpedo boats 369
Towers 369
Track 370
Trestles 372
Tubes 373
Tunnels 373
Turbines 376

United States 377

Valves 378

Water 380
Water filters 382
Water meters 383
Water pipes 383
Water power 384
Water purification 384
Waterworks and supply . . . 385
Waves 391
Weights and measures . . . 392
Wells 392
Wind 393
Wire rope 394
Wood 394

Yachts 395

ENGINEERING INDEX

NOTE. — The black-faced figures refer to the years, as -90 = 1890, and *follow* the references.

When, in dates of months, the same figures are repeated, as "Aug. 24, 24" the article is to be looked for in two or more places in the same issue.

The * indicates illustrated articles.

Aaron, Charles H. n por *E & Min* * June 6-**91**

Abbott, Samuel *Inst C E* v 102-**90**

Abel, Frederick A. por *E & Min* * June 7-**90**

Abrasion, expts. (sand blast), Thoulet *Inst C E* v 91-**88,** abs *An Mines* v 7-**87;** abrasive processes in the mechanic arts, Richards, *E & Min* July 25, Aug 15-**91**

Accidents, accident-preventing devices applied to machines, Cooper *Am M E* * v 12-**91.** See also BRIDGES—MINE—RAILROAD accidents

Accumulators, electric. See STORAGE Batteries

Actinism and electrolysis, Houston *F Inst* Dec -**91**

Adamson, Daniel *Eng* Jan 17-**90**; *Inst C E* v 100-**90**; *Inst M E* Jan -**90**; *The Eng* Jan 17-**90**

Addison, John C. *Inst C E* v 91-**88**

Advertising, newspaper, Richards *El Rev* Aug 22, Sullivan Sep 12 etc. -**91**

Aerial engineering, ed *E & Min* July 28-**88**; navigation, see AIR navigation

Aerodromics, expts. in aerodynamics, Langley *R Gaz* Sep 18-**91,** Smithsonian Contribs. Wash. -**91,** abs *Inst C E* v 107-**92**

Aeronautics. See AIR navigation; BALLOONS; FLYING

Africa and the European powers, map *E News* * Nov 21-**91**; South Africa, notes, France *Eng* July 20-**88,** cor Mar 21-**90.** See also DIAMOND mines; GOLD-fields, So Africa

Agriculture, electric applics. *El Wld* * Dec -**92**; the electric motor and the farmer, Black *E Mag* Nov -**92**; in the desert *Eng* * Dec 13-**89,** maps *Sc Am Sup* * Jan 25-**90**; engineering in India *Eng* Apr 6, * May 4, 18, * June 8, 22, * July 6, * Aug 3, 24, * Sep 7, 28, * Oct 19, * Nov 16-**88**; lines of progress in, Miles *Pop Sci* July -**88**

Agricultural machinery, sheaf-binder, Howard's *The Eng* Dec 7-**88**; Royal Societies' Show *Eng* * July 13, Smithfield Club * Dec 14-**88**, Winsor * June 28, *The Eng* * June 21, 28, July 5, 12-**89**, Plymouth *Eng* * June 27-**90**, Doncaster * June 26-**91**, Warwick, June 24, *The Eng* * June 24, * July 1-**92**

Air currents, movement of upper, Hazen *F Inst* July -**88**; ozone formation etc. and presence in *Sc Am Sup* Apr 19-**90**; biological exam. of, new method, Sedgwick, Tucker *Soc Arts Mass* -**88**; organic matter in, determination, Talbot *Tech Q* * Sep -**87**; flow of in a diverging conical trunk, driven by fan, Lodge, cor. *The Eng* Jan 4, 18, energy in a pound of, Cherry, n cor. 18, induced currents, ed. * Feb. 15-**89**. See also ATMOSPHERE

COMPRESSED, motors for tramways, N. Y., Jacobus *Am Min* * v 19-**91**; Saunders *Cassier's* * June -**92** *Eng* locomotives, Hardie, cor. June 8-**88**; Popp system in Paris Feb 15, do transmission of energy by * June 7, 21, 28, do Kennedy * Sep 13-**89**; low pressure, for tram cars, ed. Mar 14 * 21-**90**, Paris system * May 13, 20, April 10, * May 1; compound and motors, Elliott * Dec 4, 11-**91**; *E & Min* formulæ, Saunders, July 11, 'caisson disease', do 18, Aug 1-**91**

E News distribution in Paris, Popp system * Dec 14-28-**89**; Mekarski st. tramway motor * May 24, 31-**90**; graphic diagram of compression, Ingersoll Rock Drill Co. Oct 18, correction * 25-**90**; Saunders * Aug 25-**92**; do *F Inst* * May -**92**

E Rec power transmission by, C. Sellers Aug 13-**92**; *El Rev Lond* condensers, Brit. Assoc., Glazebrook (full) * Oct 3-**90**

Inst C E power transmission by, Unwin * v 93-**88**; do * v 105-**91**; Nogent tramways, Demoulin, abs. v 99-**90**, *Rev Gen Chemins* Sep -**89**

Sc Am Sup power transmission by, Popp system, Paris * Feb 9, do., Kennedy (full) * Oct 26-**89**, (full) Aug 30-**90**; production, Saunders (full) * Apr 25; Paris system (full) * May 23; use in nervous and mental affections, Corning (full) Oct 3, 10-**91**

The Eng steel receivers Nov 9-**88**; Popp system, Paris * May 3, do., expts., Kennedy Sep 20-**89**. See also STREET railroads, compressed air motive power

COMPRESSORS, compressing machinery, Paris exhib. *Eng* * Aug 2-**89**; air valve, Ingersoll Rock Drill Co. *E News* * Sep 27-**90**; * Aug 10; light portable * Oct 12-**89**; aut. regulators,

Air COMPRESSORS
Ingersoll Rock Drill Co. * Mar 28-**91** ; Atkinson's *The Eng* * July 3-**91**
ENGINES. See HOT air engines
NAVIGATION, *Cosmopolitan* mechanical flight, Langley, May, the aeroplane, Maxim, June -**92** ; *E Mag* prog., Chanute * Oct-**91**, suggestions, Kirk * Feb -**92**; *E & Min* ed. July 28-**88**; *E News* natural limitation of, J. B. Johnson, Dec 6-**90**, Mt. Carmel air-ship, ed. * Feb 21-**91** ; *E Rec* Chanute, Mar 14-**91** ; *Forum* problem of, Thurston, Jan -**90** ; *Inst C E* expts. in aerodynamics, Langley, abs. v 107-**92**, Smithsonian Contribs., Wash -**91**, *R & Eng* Chanute * July, * Aug, Sep, Philbrick, cor. n Sep, * Oct. Nov -**90** ; *R Gaz* Langley's expts Sep 18-**91** ; *Sc Am Sup* Helmer, n * Jan 17-**91** ; parachute, history * Dec 17-**92** ; *The Eng* reaction of air on planes, Lancaster, cor. * Mar 7-**90**. See also BALLOONS; FLYING machines
PIPES, friction of hot air in, cor *Eng* * Jan 6-**88** ; air vessels on pipes and pumps, M'Creath * July 5-**89**
PROPELLERS, the Blackman *Eng* Feb 24-**88** ; for ship propulsion, Vogt *Sc Am Sup* * Nov 3-**88** ; do *The Eng* Sep 28, Oct 12-**88**
PUMPS, mercurial, development, S. P. Thompson *El Eng* * Feb, * Apr, * May -**88** ; the Massey, Eames Vac. Brake Co. *R Gaz* * Dec 6-**89** ; mercurial, development, Thompson *Sc Am Sup* * Jan 21, 28-**88**, Sprengel, new form, Rawson * Oct 11-**90** ; mercurial, Wood * Jan 27-**91** ; horizontal, Longridge *The Eng* Sep 27-**89**
PURIFICATION by ozone, new method, Richardson *Sc Am Sup* Sep 28-**89**
RESISTANCE, experimental study of, Crosby *E News* June 7, 14, laws of, ed. * June 21, do. Hazen and ed. July 5, 5, correction and ed. 12, 12, Marvin, cor. 19, determination of, do. Sep 27-**90** ; at very high vels., Chanute, cor. *R Gaz* Dec 26-**90**. See also RAILROADS, train resistance
VALVE, Rand mechan. *E News* * May 11-**89**
Alabama and Tenn. *Eng* * Oct 5, * Nov 2-**88** ; iron and coal mines *Sc Am Sup* Sep 29-**88**
Alaska, Yosemite and the Yellowstone *Eng* * Dec 2—30-**92** ; wealth and resources, n *E News* Apr 4-**91**
Albert Victor, Duke of Clarence *Inst C E* v 108-**92**

Alcohol purification by hydrocarbons, Squire (full) *Sc Am Sup* * Sep 14-**89**; influence on human system, N. Davis Dec 17-**92**

Alcoholometer, Siemen's *Eng* * July 22-**92**

Alden George I., por. *Cassier's* * May -**92**

Algebra, lessons in *Pwr* files -**91—92**; determinant theorems applic., Tyler *Tech Q* Nov -**90**

Alkali process, ed. *Eng* Apr 13-**88**; trade, British, notes *E & Min* Sep 13, 20-**90**, (full) Apr 11, * 18-**91**; works, analytical methods for, Lunge Feb 14-**91**, *J. Soc Chem Ind.* See also under CHEMISTRY; NITRATES

Allan, Alexander *The Eng* June 12-**91**

Allen, Horatio, memorial notice, Forney *Am M E* v 11 -**90**; por. *E News* * Jan 11-**90**; (full) *R & Eng* Feb, Mar, Apr -**90**

Alloyage and igneous cementation, Elbers *E & Min* Nov 16-**89**

Alloys, strength, Unwin *Eng* Oct 4-**89**; Roberts-Austen Mar 16, 23, Apr 6-**88**, do. research committee report Nov 6, 6, * 13 -**91**; do. properties (full) *E & Min* * Apr 9, 16-**92**; strength at different temps., Unwin Jan 11-**90**, do. *The Eng* Oct 4-**89**; new and eng. applics., Garrison *F Inst* * June, July, * Aug, * Sep -**91**; Robert's report discuss., insets (full) *Inst M E* * Oct -**91**

Sc Am Sup Roberts-Austen (full) * Dec 8, 15, 22-**88**, strength at different temps., Unwin Nov 23-**89**, use in art metal work, Roberts * Aug 2-**90**, report (full) * May 28-**92**. See also STEEL alloys

ALUMINUM, and alloys, relative value, Pemberton *El Rev* Oct 6 -**88**; manuf. in electric furnace, Dagger *El Rev Lond* Sep 27 -**89**; copper and manganese, properties, Cowles, abs. *Inst C E* v 106-**91**, *E & Min* July 11-**91**. See also ALUMINUM alloys

BEARING metal, Dudley *F Inst* Feb, Mar -**92**, *Sc Am Sup* Apr 2-**92**

CHROMIUM and iron, Hadfield (full) *Eng* Sep 23, 30, 30, * Oct 7, 14-**92**; chrome pig iron and steel, Brustlein *R & Eng* Aug -**88**

ELECTROLYTIC decomposition and preparation, Roberts-Austen *El Wld* * Feb 4-**88**, Warren *Sc Am Sup* Mar 5-**92**

FERRO-chrome, Brustlein, *E & Min* Feb 1-**90**; iron and silicon, Hadfield *Eng* Oct 18, 25-**89**

MANGANESE, copper and aluminum, properties, Cowles, abs. *Inst C E* v 106-**91**, *E & Min* July 11-**91**

NICKEL and iron, magnetic properties, Hopkinson *El Rev Lond*

Alloys, NICKEL
Aug 8-**90,** do *El Wld* * Sep 6-**90**; nickel and steel, Riley (full) *Sc Am Sup* Aug 24-**89.** See also NICKEL alloys
STEEL, and chrome pig iron, Brustlein *R & Eng* Aug -**88**; and nickel, Riley (full) *Sc Am Sup* Aug 24-**89,** do. Mar 22-**90.** See also STEEL alloys
Allport, James *Eng* Apr 29-**92,** *The Eng* Apr 29-**92**
Alphand, Jean C. A. *Inst C. E.* v 107-**92**
Alpine engineering, Vernon-Harcourt, insets *Inst C E* * v 95-**89**
Aluminum *Am M E* an expt. with, Christie v 13-**92**; *Am Min* properties, A. E. Hunt (full) v 18, and other metals compared, Keep (full). v 18-**90**; *Cassier's* production, E. P. Allen * Feb, * Mar -**92**
El Eng problem future, from chemical standpoint, Wahl June 3-**91**; *El Rev Lond* do Aug 21, Sep 4-**91**; Guillaume May 8, properties, Hall, June 12-**91**; *El Rev* (name) 'Alium' for, O. Smith May 30; probable future, Wahl, (full) June 13-**91**; *El Wld* do (full) June 6, discuss. 13-**91**; properties, Hall May 30; 'Alium' (name), O. Smith 30-**91**
Eng Dagger Oct 18-**89**; Hunt, Langley and Hall, Mar 28, Apr 18-**90,** *E & Min* do. Mar 8, 15, 22-**90,** Ingalls, Jan 2-**92**
E News Feb 16-**89**; properties, Hunt, Feb 22, Mar 1; comparative cost Nov 1, production, Hall proc. * 8-**90**; Hunt (full) Feb 28, Mar 7, July 11-**91**
E Rec processes, Sep 5-**91**; *F Inst* Henderson, Oct -**88,** Roscoe, Sep -**89,** problem, Richards, Mar -**91**; *Inst C E* abs. v 110-**92,** *Dingler's* 284-**92**; *Locom* Apr -**92**
R Gaz Hunt, Apr 29-**92**; *Sc Am Sup* and sodium, Sep 15-**88,** Henderson (full) Jan 5-**89,** present status, Packard, Jan 9, action of liquids on, Lunge, Mar 5, Ingalls, May 28-**92,** *E & Min; Soc Arts Mass* Hunt (full) * -**91,** do. inset *Tech Q* * Apr -**91**; *The Eng* Aluminium Co. Aug 3-**88**; *Tech Q* in iron and steel, direct det., Drown, Oct -**91**
ALLOYS, Cowles, smelting, Heroult proc., Dewey *Am Min* v 18, * 18-**90**; manuf. in elec. furnace, Dagger *El Rev Lond* Sep 27-**89,** do *El Rev* Oct 19-**89,** do *El Wld* Nov 9-**89**; Heroult proc. *Eng* Oct 10-**90**; improvements in manuf., n *E & Min* May 24-**90,** *J Soc Chem Ind;* by Heroult proc. *E News* Sep 8-**88**; relative value *F Inst* Oct, correction, Pemberton, Nov -**88**; produced by elec. furnace, Langenhove, abs. *Inst C E* v

Aluminum, ALLOYS
91-**88,** *Assoc Ings Liege* -**87**; Boby *Sc Am Sup* Feb 2, (and silicon) production in elec. furnace (Cowles proc.), Dagger (full) * Nov 30-**89**
BRONZE and brass, as materials for propellers, Cowles *Am Min* v 18-**90**; do (full) *Sc Am Sup* Apr 12-**90**; bronzes, diagram *E News* * Feb 8-**90**
CARBURETTED iron, in, Keep *Eng* June 27-**90**
CAST iron, in, Keep *Am Min* v * 18-**90**; ed., Keep *Eng* Aug 31, 31-**88**; do *E & Min* * Aug 18-**88,** do. * Jan 25-**90**
CASTNER, sodium and aluminum procs. *E & Min* * Aug 18-**88** *Eng*
COWLES proc. in England *El Wld* * Sep 29-**88**
DEVILLE-Castner proc. *Eng* Mar 22-**89**
DRAWING press, al. in, O. Smith *Am Min* v * 18, 18-**90,** do. *Eng* * Aug 29-**90**
ELECTRIC production, Brown *El Eng* * Apr 29-**91,** do *El Rev Lond* May 22, 29, June 26-**91,** do *El Rev* May 2-**91,** do (full) *El Wld* May 2, Crocker, discuss. 16-**91**; Stoke-on-Trent plant, England (full) *E & Min* * Sep 22-**88**; reactions, Bucherer, Jan 6, Farmer, 27-**91**; elec. smelting, Boby *Sc Am Sup* * July 13-**89**; Farmer, July 25, reactions in Aug 1-**91**
FERRIC cake (for sizing paper) *Sc Am Sup* Nov 9-**89,** *Chem Tr J*
FLUORIDE, electrolysis of, Minet *El Eng* Dec 10-**90,** *El Rev Lond* Dec 19-**90,** *Compt R*
GRABAU'S method, ed. *Eng* Dec 20-**89,** abs. *Inst C E* v 101-**90,** *An Mines, Genie Civil* v 16-**89,** v 17 May -**90**
HEROULT proc., Dewey *Am Min* * v 18-**90**; *El Wld* * Nov 17-**88,** * *Industries; Eng* Oct 10-**90**; (full) *E & Min* Dec 1-**88,** and Cowles, Lowrey cor. Apr 27-**89**; Grabau's method, abs. *Inst C E* v 101-**90,** *Genie Civil* v 16-**89,** 17 May -**90**; *Sc Am Sup* * Dec 8-**88**
INSTRUMENTS of precision, Blake *Am Min* v 18-**90**
MANUFACTURE and industry, value, Dagger, ed. *El Rev Lond* Apr 8, July 15, Aug 19, Sep 2-**92**; Deville-Castner proc. *Eng* Mar 22, ed. * Aug 2-**89,** Lauffen-Venhausen works * Feb 20-**91**; improvements in, n *E & Min* May 24, Grabau's method. Ichon Aug 16-**90,** *An Mines;* and uses, Hunt *E News* May 5, expt. with, Christie 19-**92,** do., Hunt (full) *F Inst* Apr -**92**; extraction on a commercial basis, Seymour, Roscoe (very full) *Sc Am Sup* Aug 24-**89,** Hall proc. * Feb 1, (pure) (full) * June

Aluminum MANUFACTURE
7-**90**, value, Dagger Aug 15-**91**, Hunt (full) Apr 23, May 14 etc -**92**; *The Eng* * Nov 21-**90**
ORE, Nichols, n *Am Min* v 16-**88**
RAILROAD work, in, ed. *R Gas* Nov 14-**90**, Hunt, Mar 27-**91**
SPECIFIC heat of, Richards *F Inst* Feb -**92**
STEEL, in steel castings, Keep *Am Min* * v 18-**90**, Hadfield (very full) v * 19-**91**, in steel ingots, Langley, iron and steel direct determination, Drown, McKenna v 20, 20-**92**; Keep *Eng* May 23-**90**; strength, etc. (full) *E News* Oct 11-**90**; Hadfield *Sc Am Sup* Apr 4-**91**
SULPHIDE proc. and ap., Emanuel's *Sc Am Sup* * Feb 6, formation, Bucherer, Dec 24-**92**, *Chem Trade J*
TESTS *Eng* May 2-**90**; transverse strength *E News* Mar 15, (full) Oct 11-**90**
U. S. production, Packard *E & Min* July 11-**91**
USES, Hunt *R & Eng* July -**92**; and applics., Addenbrooke *Sc Am Sup* June 18-**92**, *J Soc Arts Lond;* Dagger *The Eng* June 6-**90**
WROUGHT iron and steel castings, in, Keep *E & Min* Aug 30-**90**, *Am Min*
Amalgams, electric conductivity of, Weber, abs. *Inst C E* v 92-**88**, *Central Elek* -**87**
America, Fourth centennial Spanish exhib. *F Inst* Jan -**92**; improvements (boasting), Sweet *The Eng* May 6-**92**, *Am Machinist;* manufactures, recent growth *The Eng* Nov 25-**92**; American Powers conference, Henderson *Sc Am Sup* June 22-**89**. See also UNITED STATES
Ammonia and tar recovery from blast furnace gases *E & Min* * May 12, 19-**88**; liquor utilization, Humphreys *Sc Am Sup* May 19, use as refrigerating agent, Lightfoot, 26-**88**, production from coal, Mond (full) * Sep 28-**89**; properties, De V. Wood *Am M E* * v 10-**89**, experimental determination of latent heat of, Jacobus * v 12, 12-**91**; liquid, composition and manufacture, Strombeck *F Inst* July, n Aug -**92**. See also under CHEMISTRY
ENGINES, aqua, theory and tests on Edison incand. lighting plant, Magovern *Am C E* * v 19-**88**, ed. *The Eng* July 19-**89**
Ampere, Andre M. n *Sc Am Sup* Dec 1-**88**
Anæsthesia, discovery *Locomotive* Nov -**89**, anæsthetics, Chisolm *Sc Am Sup* Apr 21-**88**

Anderson, Henry J. C. *Inst C E* v 106-**91**
Anemometers testing, Gieseler *E Rec* * July 13-**89**
Angle, the economical, Honey *Sc Am Sup* * Jan 17-**91**
Angle-iron bevelling machine *The Eng* * June 6-**90**; **tests,** Loweth *E Rec* Feb 1-**90,** *J Assoc E Socs*
PRISMS, Gieseler *E News* * May 12-**88**
Animals, animal arithmetic, Royer *Sc Am Sup* Feb 2-**89,** *Pop Sci*; as a motor-machine, Thurston *Cassier's* Feb -**92**; **how** the world appears to, *Sc Am Sup* Jan 12-**89**· **language of.** Duthiers Feb 13-**92,** *Pop Sci*
Annealing iron or steel, non-oxidizing proc., H. P. Jones *E News* * Jan 2-**92**
Antagonism, Grove *Sc Am Sup* June 9-**88**
Antartic exploration, Griffiths (full) *Sc Am Sup* Jan 10-**91**
Anthony, W. A., por. *El Wld* * Feb 1-**90**
Antimony ore dry concentration, Heard *E & Min* Feb 23-**89,** Kemp, Jan 2, smelting, English proc., Rodger, Mar 12-**92,** *J Soc Chem Ind* Jan 30-**92**; *Locom* May -**92**
Anthropology, Evans *Sc Am Sup* Nov 15-**90**; anthropolog. work in Am., Starr *Pop Sci* * July -**92**
Apatite mining in Canada *Sc Am Sup* Dec 8-**88,** *E & Min*
Aransas Pass, Texas, imp. *E News* * Aug 30, Haupt, cor. * Sep 13-**90**
Arc, length of, method of determining, Hartl, abs. *Inst C E* * v 107-**92,** *Zeit Deut Ing* -**91**
Arch, Arthur J. E. *Inst C E* v 101-**91**
Archbould, Ralph *Inst C E* v 101-**90**
Archæological discovs. in Ohio *Sc Am Sup* * Aug 27-**92,** *Cal Mag*
Arches, masonry, stability of loaded, Wurtele, and discuss. *Am C E* * v 23-**90**; the arch, Richardson *Eng* * Jan 13-**88**; do. *Sc Am Sup* * Mar 3-**88**; templet for, various thickness *E News* * Mar 8-**90**; wet, German method of repairing * Dec 13-**90**; max. stresses, Werner (full) *F Inst* * Oct, inset * Nov Dec -**92**; arched ribs and voussoir, Martin *Inst C E* * v 93-**88**; dead and live loads on masonry, McClintic *Lehigh Eng J* June-**88**; error in theory of masonry, Baker *R Gaz* * May 31-**89**
EQUILIBRIUM. curves, Suplee *Am M E* * v 11-**90**
GOUR Noir viaduct, Vezere river, Uzerche, France, inset *E News* * Aug 18-**92**

Arches, MT. Vernon viaduct *E News* * Sep 1-**92**

SEGMENTAL and two-nosed catenaries, Alexander *Eng* * July 12 -**89**

SKEW or spiral construction, Cincin. & Rich. R., Paret *Lehigh Eng J* Feb -**88.** See also BRIDGES, skew arch, Oakley.

Architects, Am. Inst., pro. *E Rec* Oct 27-**88,** constitution, Dec 7-**89,** pro. Oct 31, Nov 7-**91**

Architect's and engineer's fee, German schedule *E Rec* June 15; convention Nov 30-**89**; legal decision, Dec 15, 22-**88**; the architect and the engineer, ed. *R & Eng* Dec -**90,** *Pop Sci;* offices, Burnham, Rookery, Chic. *E Rec* * Jan 11, Shepley * Feb 15, Wilson, Phil. * 22, Chandler, Phil.* Mar 1, Boston, June 7-**90,** organization, Post, N. Y. * Nov 7, McKim's, N. Y. * Dec 5-**91**

WESTERN Assoc. pro. *E Rec* Dec 1-**88**

Architectural work, J. Robinson *E Mag* * Mar; notes, Ferree, files to Dec -**92**; constructive faculty, evolution of, Burnett, Aug -**92,** construction, Monier system *E & Min* * June 6-**91**; decoration, World's exhib., Millet *Scrib* * Dec -**92**

DESIGN, elements of, Statham (full) *E Rec* * Jan 14-**88,** do. (full) *Sc Am Sup* * Feb 18, 25 * May 19, 26 * June 9, 16-**88**; logical basis of, Walker *Tech Q* May -**90**; engineering, Freitag *Sc Am Sup* * Aug 22-**91**

Architecture, art and utility in building, Ferree *E Mag* Aug, recent tendencies do. * Sep -**91**; pessimism of modern, Edelmann, insets * Apr; beginnings of, Kirk * May; ornament in, Sullivan, insets * Aug; in wood, protest, Kimbrough, Dec -**92**; physiological basis of the sense of beauty of form, Goodman (full) *Sc Am Sup* May 10-**90.** See also BUILDINGS and building

AMERICAN Fine Arts Soc. bld., N. Y., doorway, inset *E Rec* * Dec 31-**92**

APARTMENT house, Yosemite, N. Y., entrance *E Rec* * June 27-**91**

CATHEDRAL, Albi, France, inset *E Rec* * Apr 18-**91**; builders of the cathedrals, Snow *N E Mag* * Dec -**92**; Siena cath., Pisano *Sc Am Sup* * Oct 19-**89**

CHATEAU Epreville-Martainville, France, inset *E Rec* * Sep 26; (Lot) France, inset * July 25-**91**; Josselin, Brittany, inset * Jan 23-**92**

CHICAGO, Ill., Herald building, inset *E Rec* * Nov 14-**91**; sketches in *Sc Am Sup* * Dec 3-**92**

Architecture, CHURCH at Chateauneuf (Charente), France, inset *E Rec* * Sep 19; of St. Paul, Dax (Landes), France * June 6-**91**

CITY Hall, the, in Am., Ferree, insets *E Mag* * Nov -**92**; Bremen, Germany, inset *E Rec* * Dec 12-**91**; Cologne, Ger., entrance, inset * Apr 2; Hotel de Ville, Poitiers, France, inset * Dec 10-**92**

CLUB house, Century, N. Y., doorway, inset *E Rec* * Dec 19-**91**; Montauk, Brooklyn, inset * Apr 9; Catholic, N. Y., inset * Dec 17-**92**

COLUMBIAN exhib., U. S., Chicago, Van Brunt *Century* * May—* Aug -**92**

COUNTRY houses, Cambridge, etc., inset *E Rec* * Jan 17-**91**; Cohasset, Mass., interior, inset * Apr 23-**92**; English, inset * Aug 29-**91**; Arthur Little's, Boston, inset * Feb 20; Geo. Macculloch, Morristown, N. J., inset * Mar 26; Marblehead Neck, interior, inset * Jan 16-**92**; Swampscott, Mass., inset * Aug 15, Elihu Thomson's do, inset * May 9-**91**

COURT house, Beauvois, France, inset *E Rec* * Nov 19-**92**

FRANKFORT-on-Main, Ger., Union R. pass. station, insets *E Rec* * Sep 5-26 * Dec 5-**91**. See also BUILDING

GALLERY Victor Emanuel, Milan, inset *E Rec* * July 30-**92**

LIBRARY, Tilden Trust, N. Y., proposed, Bigelow *Scrib.* * Sep -**92**

MEAT market, old, Haarlem, Holland, inset *E Rec* * Feb 14-**91**

MOBBERLY Hall, Cheshire, England, inset *E Rec* * Nov 26-**92**

MUSEUM building and arrangement, Ferree *E Mag* * Nov -**91**; Amsterdam, Holland, inset *E Rec* * Feb 28; Hague, do., inset * May 23-**91**

MUSIC Hall, N. Y., main entrance, inset *E Rec* * Feb 13-**92**

PALACE of Justice, Hague, Hol., inset *E Rec* * Mar 7-**91**

RECEIVING vault, Woodlawn cem., N. Y., inset *E Rec* * Feb 27-**92**

RESTAURANT, Frankfort Palm garden, inset *E Rec* * Oct 31-**91**

ROMERBURG, Germany, inset *E Rec* * Dec 26-**91**

SWISS Vecchia inn, Maloja Pass, inset *E Rec* * Apr 16-**92**

Arctic exploration, Peary expedition, Nansen's No. Pole exped. *Sc Am Sup* * Nov 26, 26-**92**

Areas of segments *Locom* * Jan -**90**, calculation, table, June -**91**. See also INTEGRATOR

Argall, Philip, por. *E & Min* * Dec 5-**91**

Argentine Republic, ed. *Eng* Dec 27-**89**; finance *E & Min* Apr 20-**89**; R. map *E News* * Dec 8-**88**; Jan 26-**89**; notes, Shunk, Feb 22, Mar 22-**90**; wheat in *Sc Am Sup* Apr 14-**88**

Arithmetic, curiosities in figures *E News* Dec 29-**88**; peculiarities of the figure 9, Hill, cor. Feb 2-**89**; Hindu May 10; the number 142,857, cor. n Oct 25-**90**; lessons *Pwr* files -**91**-**92**; method of quarter squares, Blater, Glaisher (full) *Sc Am Sup* Nov 30-**89**; cube root, Wood Sep 6, do. and rapid addition, Boutelle. Nov 8-**90**; roots extracting, new method, Westervelt Apr 4-**91**. See also under MATHEMATICS

Arkansas mines, Branner, *E & Min* Oct 20-**88**

Armada (Spanish), defeat in 1588 *Sc Am Sup* * Aug 25-**88**

Armor, cellulose *E News* Dec 1-**88**, steel, tests at Annapolis, Sep 20, 27 * Oct 4-**90**. See also GUNNERY and armor

Arms and armor of ancient Japan, Baba *Soc Arts Mass.* -**88**

Army, Austro-Hungarian, Kuhn *Harper's M* * June; Italian, Goiran * Aug -**92**; European armies, Dodge *Forum* July -**92**; of Kukuanaland, Michaelis *Sc Am Sup* Oct 26-**89**, *F Inst*

Arrol, William, por. *Eng* * Feb 28-**90**

Arsenal, Woolwich *The Eng* * Oct 2-**91**

Arsenic determination, Canby *Am M E* v 17-**89**, *Birm* May -**88**; *Locom* June -**92**

Art, fine, composition and selection of a subject, Ellis *Sc Am Sup* * June 1-**89**; use of cloisonne for decoration, Heaton (full) May 9; pictures, durability painted with oils and varnishes. Laurie June 20; Miller, Aug 22; decorative treatment of natural foliage, Stannis (full) * Nov 21, 28 * Dec 5, 19, 26-**91**

Artesian wells. See WELLS, artesian

Artificial limbs, Mark's *F Inst* * May -**89**

Artillery service in the rebellion, Tidball *J Mil Ser Inst Mag* May -**92**. See also GUNNERY and armor; GUNS

Arts and manufactures, prog. rev. *F Inst* Feb -**88**. See also SOCIETY of Arts, London

Asbestos *E & Min* Jan 2-**92**; Rogers *Sc Am Sup* June 16-**88**; Canadian industry *E & Min* Sep 17-**92**; chem. composition, Donald, June 27-**91**, do. *Sc Am Sup* July 18-**91**; mining, Quebec, Ells *E & Min* Apr 25-**91**, Canada, abs. *Inst C E* v 107 -**92**, *Am Gas Lt J* Oct 26-**91**; U. S. production, Parker *E & Min* Sep 5-**91**, *Cen Bull;* mining, manufac. and uses, Fisher *The Eng* Dec 16-**92**

Ashburner, Charles A., Lesley *Am Min* v 18 -**90**
Ashworth, John *Inst C E* v 95 -**89**
Asphalt, uses, Greene, insets (full) *Am Min* * v 17 -**89,** do. *Soc Arts Mass* -**89**; industry, France, abs. *Sc Am Sup* * July 19-**90,** *Genie Civil;* plates for water-proof construction *E News* * Nov 1; price of, Oct 25-**90**; Trinidad *E Rec* Nov 12-**92**; use in irrig. works, Cal., Purcell *Inst C E* v 110 -**92**; nature and uses, Greene *Soc Arts Mass* -**89.** See also PAVEMENTS; ROADS; STREETS
Asphalto-genesis theory, Wurtz *E & Min* July 27-**89**
Asphaltum, Gilsonite or Uintahite, mts., Utah, Locke *Am Min* v 16 -**88,** Blake v 18 -**90**; and ozokerite, U. S., Parker, cenbull. *E & Min* Aug 15-**91**; Kemp, Jan 2-**92**; Parker *E Rec* Aug 1-**91**; *Sc Am Sup* Sep 19-**91**
Assaying of lead, silver and gold, F. Clark *Tech Q* May -**88**; tin ores, dry, Hofman (full) May, Aug -**90.** See also CHEMISTRY; METALLURGY; METALS and names of metals and minerals
Astronomy, two remarkable coincidences, d'Auria *F Inst* Oct -**88**; as applied to land surveying, Downes *Inst C E* * v 108 -**92**; recent science, Kropotkin *19th Cent* May -**92**; how to measure the invisible, Parkhurst *Sc Am Sup* Apr 18; the story of the universe, Huggins * Sep 12; central lateral motion of the worlds of space, Wheeler, Dec 5; astronomer's work in a modern observatory 19-**91**; new, Ball, Feb 27-**92.** See also PHOTOGRAPHY, stellar; SUN; TELESCOPES, etc.
ABERRATION problems, Lodge *Sc Am Sup* * Nov 5-**92**
ARCTURUS, recent conceptions, Knight, *Sc Am Sup* July 4-**91**
AURORA Borealis *Sc Am Sup* Mar 16-**89**
COMETS and meteors *Eng* Dec 30-**92**; five-fold *Sc Am Sup* * Feb 18-**88**; Coakley, Dec 10-**92**
COSMOSPHERE for teaching, Bailey *Soc Arts Mass* -**88**
HELIOMETER, Cape of Good Hope observ. *Eng* * Jan 3, 10 -**90**
HELIOSTAT, Grubb's, Smithsonian Inst., Wash. *Eng* * May 16-**90**
INSTRUMENT works, Grubb's, Dublin *Eng* Dec 14-**88**
LICK observatory, Mt. Hamilton, Cal. *Eng* * July 6, 27. inset * Aug 10, 17, 31 * Sep 7 * Oct 26-**88**; Holden *Sc Am Sup* Sep 29-**88**; latest discovs. Nov 15-**90.** See also PHOTOGRAPHY, ap., Lick observ.

Astronomy, MARS, map *E News* * May 18-**89**; physical aspects, map *Sc Am Sup* * Sep 8-**88**; *Science*, do. and views, Proctor *Sc Am Sup* * Oct 13-**88**, *Knowledge;* opposition, Lockyer *Sc Am Sup* * Oct 15-**92**

MERCURY *Sc Am Sup* * Apr 26-**90**

METEORITES, meteors *Locom* July -**90**; August *Sc Am Sup* Oct 13-**88**; notes, Lockyer (full) * Feb 2; and what they teach, Hensoldt, Nov 16, 23-**89**; Wash. Co., Kan. Aug 23-**90**; meteoric finds, Foote, Feb 6-**92**; *Nature; Science.* See also ASTRONOMY, comets.

MILKY way, Gore *Littell's* Apr 30-**92**

NEPTUNE, discovery (great discoveries) *Locom* Dec -**89**

OBSERVATORIES, Levander *Sc Am Sup* Aug 29, (full) Sep 5-**91**; Halsted ob. spectroscope *Eng* * July 22-**92**; Pekin ob. *Sc Am Sup* * Jan 12-**89**; Warner ob. *Eng* * Jan 27-**88**. See also ASTRON., Lick-Sayre observs.

SAYRE observ., Beth., Pa., deflection of plumb line at, Frescoln *Lehigh Eng J* June -**88**

SPACE, constitution of, Hirn, bk. review *Eng* Nov 8-**89**, do. *Sc Am Sup* Jan 11, do. De V. Wood, Apr 5; the grants of starry space, Jan 25-**90**

SOLAR spectrum, limit of, Hartley *Sc Am Sup* May 4-**89**, *Nature*

STARS, in handle of big dipper, simultaneous culmination method, Marcy *E News* * Sep 5-**91**; two extraordinary, Pickering *Locom* * June -**90**; double * Oct -**91**; age of the, Janssen *Sc Am Sup* Jan 28, Feb 4-**88**; distances, Oudemans, Mar 8-**90**; double and multiple, Knight, Oct 8-**92**

TELESCOPES, photographic equatorial, Melbourne observ. *Eng* * Dec 19-**90**; clock-driving ap., Grubb, insets *Inst M E* * July -**88**. See also TELESCOPES.

URANIA Institute, Berlin (Lick observ.), Holden *E Mag* * Mar -**92**; planet Uranus, Gregory *Sc Am Sup* Aug 24-**89**

VENUS planet *Sc Am Sup* * Nov 12-**92**

Atchison, Arthur T. *Inst C E* v 105-**91**

Atkinson, Charles R. *Inst C E* v 100-**90**

Atkinson, William P. *Tech Q* May -**90**

Atlantic coast, subsidence of, *Sc Am Sup* Aug 22-**91**; navigation, prog., ed. *Eng* June 20, 27-**90**

Atmosphere, structure and cause of rain, Velschow *Am C E* * v 23-**90**; vertical distribution of temperature *Eng* Nov 1, 15,

Atmosphere.
29, Dec 6, 20-**89**, resistance, experimental study of, Crosby, May 30, June 6 * 13-**90**, do. (full) *El Wld* * May 24-**90**, do. *E News* May 31-**90**; atmospheric electricity, expts., Weber, abs. *Inst C E* v 99-**90**, *Elek Zeit* -**89**; optical phenomena of, Cornu *Sc Am Sup* * Apr 27-**89**, the upper atmosphere, Ranyard * Dec 19-**91**, circulation of, Peruter, July 9-**92**, *Nature*. See also AIR resistance: RAILROADS, atmospheric—train resistance

Atoms, atomic volume and tensile strength, Fessenden *El Wld* * Aug 22-**91**; intelligent *Sc Am Sup* Nov 28-**91**, arrangement in space in organic molecules, Wislicenus, Feb 18-**88**, *Am Chem J*. See also FORCE

Australia, South, mineral wealth *Eng* Jan 9-**91**; colonies progress *E & Min* Dec 22-**88**; prog., Melbourne *Sc Am Sup* * Apr 13-**89**; works and manufactures, New South Wales *The Eng* Sep 20-**89**, engineering notes, Aug 21, Nov 13, 20-**91**

Autographs, foreign electricians *El Wld* * May 28-**92**

Automatic machines, Lynde's *Eng* Jan 25-**89**. See also SLOT machines

Avalanches, Col., Fernow *Am Min* v 18-**90**; in Austria and Switzerland, Pollack *R Gaz* Sep 25-**91**. See also MOUNTAIN slide, Curtis; RAILROAD snow protection, slides, Selkirk mts., Canada

Ayrton, W. E. por. *El Wld* * Dec 20-**90**, do. *Sc Am Sup* * Mar 19-**92**

Bacteriological research, bran fermentation, Wood *Sc Am Sup* * July 12-**90**; bacteria and surgery, Roberts, July 11-**91**

Bag machinery, paper, Paris exhib. *Eng* * May 31-**89**; rotary block-bottomed paper, Duerden, discuss., insets *Inst M E* * Oct -**89**

Bags and bagging, Arkell *Sc Am Sup* Aug 4-**88**

Baker, Benjamin, por. *Eng* * Feb 28-**90**

Baker, W. L. *J Assoc Eng Socs* Nov -**88**

Balbach, Edward, n por. *E & Min* * Mar 28-**91**

Baldwin, John *Inst C E* v 107 -**92**

Baling press, Boomer portable *The Eng* June 29-**88**, Cyclone hydr. * Sep 4-**91**

Ball and socket joints, White's adjust. extension, com. rep *F Inst* * Aug -**89**

Ballard, Stephen *Inst C E* v 104 -**91**
Balls, hollow copper *Locomotive* * Oct -**91**
Balloons, how to cross Africa in *Rev of Revs* Sep -**92**; construction, Myers *Sc Am Sup* Nov 30-**89,** history of aeronautics, Stevens (full) * Feb 22, * Mar 1-**90.** See also AIR navigation
Bancroft, Hubert H., por. *Sc Am Sup* * Oct 15-**92**
Band-saw mill, the Am., Suplee *Cas* * Feb -**92**; saws for heavy timber, ed. *Eng* Aug 30-**89**
Barium (metal) *Locom* Aug -**92**
Barnes, F. W., por. *E & Min* Jan 16-**92**
Barometers, Gieseler *E News* Aug 4-**88,** the aneroid, do. *F Inst* * Nov -**89,** do. use for measuring heights *The Eng* Mar 13-**91,** do. use in Western Mass. by Geol. survey, Cutter, *Tech Q* Sep -**87**
Barrel machinery, universal *The Eng* Sep 20-**89**
Barrels, cement, etc., cubic capac. n *E News* Feb 15, 22, Mar 29-**90**
Barrett, John P., por. *El Wld* * Dec 6-**90**
Barry, William H. *Inst C E* v 100 -**90**
Bartol, B. H. *Am M E* -**88,** *F Inst* June -**88**
Barytes and umber mines and refining mills, Cleator Iron Ore Co., Caldbeck Fells, Addison, inset *Inst C E* * v 102 -**90**
Bassett, Alexander *Inst C E* v 92 -**88**
Bateman, John F. L. (full) *Inst C E* v 97 -**89**
Bates, Henry W., por. *Pop Sci* * Nov -**92**
Batterbee, Ranson C. *Inst C E* v 95 -**89**
Battle-ships. See NAVIES, names of countries
Bayly, George H. *Inst C E* v 93 -**88,** 98 -**89**
Bayonne, Port of *Eng* * Dec 6-**89**
Bazalgette, Joseph W. *Eng* Mar 20-**91,** (full) *Inst C E* v 105 -**91,** *The Eng* Mar 20-**91**
Beach protection. See NEW Jersey coast movements
Beams and girders, the continuous girder as a tipper, Lindenberger *Am C E* * v 26 -**92**; theoret. strength, cor. *Eng* July 1-**92.**
E News cross-sections, unsymmetrical, Johnson * Feb 4-**88,** loading long girders on cars, movable frame * Jan 9-**92**
F Inst jointed bow, theory, Werner * May-* July, Sep, Oct; continuous, indeterminate multipliers, Lindenberger, Dec -**88**
Inst C E jointed bow, Werner abs. v 95 -**89**; cast iron and steel, expts. on strain in outer layers, Segundo (full), inset * v 98 -**89**; braced, stresses and deflections, Stewart * v 109-**92**

Beams and girders

R & Eng contin. framed, stress in, Hiroi May -**88**; lattices, stresses on, method of obtaining, Robertson *Sc Am Sup* * Mar 24-**88**; expts., Sondericker, inset *Tech Q* * Oct -**88**

The Eng struts, stiffness of, expts., Mason Coll. Jan 6; lattice girders, graphic evaluation of stresses in flanges, Robertson Mar 16, do. Stokes, cor. Apr 27, do. Parsey, cor. May 18, stresses in statically undetermined systems, Ende, cor. 18; transverse strength of beams, D. Clark, June 1, 22, 29-**88**. See also BRIDGES; BUILDINGS; GIRDERS; ROOFS, etc.

Bearings, materials without lubricants, Hedges anti-friction *El Rev Lond* Aug 12-**92**, graphite self-lubricating *E News* * Feb 8-**90**, May 19-**92**, do. *The Eng* Aug 19-**92**; metals, phosphor-bronze *Eng* July 29-**92**, *R & Eng*

Beauchamp, Clayton S. *Inst C E* v 100 -**90**

Becker, Max J., por. *E News* * Feb 9-**89**

Beckley, John N., por. *St R J* * Sep -**92**

Becquerel, Edmund, por. *Sc Am Sup* * July 4-**91**

Beer, treatment and storage, Hartley *Sc Am Sup* May 2-**91**, preservation by pasteurization * Nov 19-**92**

Bell, Alexander G., por. *El Eng* * Sep 10-**90**, *El Rev* Sep 10-**92**

Bell, William *Inst C E* v 109 -**92**

Bell, Wilson, *Inst C E* v 101 -**90**

Beltrami, Guiseppe C. and the Miss. river *Locom* Mar -**90**

Belts and belting, tractive force of leather on pulley faces, S. Smith *Am M E* v 10 -**89**; Schieren *El Rev* * Mar 5-**92**; horse power corresponding to various speeds, table *El Wld* Feb 14-**91**; transmission of power by, Gale *J Assoc Eng Socs* Nov -**88**; angle of contact, table *Pwr* Apr -**92**; Jewell Belting Co. *St R J* * Apr -**92**

CARRIERS and machinery, Fischer, abs. *Inst C E* * v 110 -**92**, *Zeit deut Ing* v 35 -**91**

FASTENINGS *Pwr* * Aug -**89**; Sargent's fastener *The Eng* Oct 12-**88**

LEATHER, width of single, for various horse powers, Grimshaw, table *El Eng* Apr 22-**91**; Schieren * Mar -**88**, do. *El Rev* * Mar 3-**88**; and canvas-rubber, comparative tests, S. Webber *El Rev Lond* Sep 5-**90**, do. *El Wld* Aug 23-**90**

LINK, Page Co. *El Rev* * Apr 12-**90**

TESTING machine, Alden *Am M E* * v 12 -**91**

Bennett, William C. *Inst C E* v 99 -**90**

Berlin, street cleaning n *E News* May 31-**90,** do. and paving in '89, Dec 13-**90.** See also GAS supply; PAVEMENTS; SEWERAGE; WATER-works, etc.
Berliner, Emile, por. *El Eng* * Nov 19-**90**
Bernays, Edwin A. *Inst C E* v 91-**88**
Berwind, Charles P., por. *E & Min* * Dec 13-**90**
Bessemer, Ala. *Eng* * Aug 22-**90**
Bessemer, Henry, autograph letter on iron and steel metallurgy and success of his invention, Kitson addr. *Am Min* * v 19 -**91**; por. *Sc Am Sup* * Aug 29-**91**
Best, Stephen C. *Inst C E* v 109 -**92**
Beton manufacturing and lifting ap., Port of Bilbao *Sc Am Sup* * Nov 19-**92.** See also CEMENTS and mortars
Bevel gear cutting machine, Paris exhib. *Eng* * Nov 8-**89**
Beverages, Simmonds *Sc Am Sup* June 30-**88**
Bibliography, Pantobiblion, Internat. Rev. of World's Scientific Literature, Kersha, ed., St Petersb., notice *R & Eng* Aug -**91.** See also INDEX
Bibra, Charles F von *Inst C E* v 100 -**90**
Bicycles, exhib. *Sc Am Sup* * Mar 30-**89,** Stanley exhib. * Mar 29-**90,** what keeps them upright, McDiarmon, cor. * Oct 29-**92**; Stanley exhib. *The Eng* Feb 10, 17, 24-**88,** * Feb 22-**89,** * Feb 7, 14-**90,** * Feb 13, 20, * Dec 25-**91**
Bidder, G. P. (mental cal.), Pole *Inst C E* v 103 -**91**
Bigg-Wither, Thomas P. *Inst C E* v 103 -**91**
Bilbao ship-building yard *Eng* * Oct 25-**89**
Biology, protoplasm and cells, recent science, Kropotkin *Nineteenth Cent* May -**92**
Bird, James B. *Inst C E* v 109 -**92**
Biscuit machinery, Baker's *The Eng* * June 14-**89**
Bismuth *Locom* Sep -**92**
Bitumen and compounds, Blake *Am M E* v 18-**90,** *Wash* Feb -**90**
Black, Frank C. *Inst C E* v 98 -**89**
Black Hills of Dakota, ore deposits, Carpenter (full) *Am M E* * v 17 -**89**
Blake, Francis C. por. n *E & Min* * Mar 14-**91**
Blast furnaces, iron, *Am Min* expts. illus. descent of the charge, Richards * v 16 -**88**; lines, Walsh; effect of vel. and tension of gases on reduction of ores, T. Robinson; large, on Ala. material, Gordon * v 17 -**89**; Durham, filling and blowing in,

Blast furnaces
Fackenthal, insets; peculiar working, Wittman * v 18 -**90**; Am. development with reference to large yields, Gayley (full) * v 19 -**91**, do. discuss. (full); first in Am., Adams * v 20 -**92**
Cassier's notes, Hartman, Sep-**92**, do. *F Inst* inset * Aug-**92**
Eng Am. practice, Hudson * Feb 1, Cochrane, Nov 1-**89**
E & Min how pig iron forms in, Elbers, Aug 24, Nov 2-**89**; development and large yields, Gayley * Oct 4-**90**
E News selection of ores, limestones and fuel for, Gordon, Feb 20-**92**
Inst M E practice with lime as flux, Cochrane, discuss. Oct -**89**
Sc Am Sup Am. development, Gayley (full) * Nov 15-**90**; practice, Hudson, Feb 16-**89**, *Ironmonger;* development of Am. industries since Columbus, Durfee *Pop Sci* * Dec -**90**, Jan etc. -**91**; descent of charge, expts., Richards *Tech Q* * Dec -**87**
BIRMINGHAM district practice, notes on iron-ores and fuels, Brainerd *Am Min* v 17-**89**
BLAST, cal. of, Ledebur *E & Min* Feb 21-**91**
CHARGES, expts. on descent of, Richards *Eng* * Jan 20-**88**; cal. of, Ledebur (full) *E & Min* Dec 13-**90**
CHARGING-bells, new device for operating, Roberts *Am Min* * v 16 -**88**, do. *E & Min* * Apr 21-**88**; devices, Howe * Aug 23-**90**
CHEMICAL reactions in, Elbers *E & Min* Feb 22-**90**, investigation, Ledebur, May 23, 30-**91**
CUPOLA furnace, Stewart 'Rapid' *Eng* * Dec 5-**90**; construction for melting pig iron, Gouvy, Durfee *E & Min* * Feb 16, 23 * Mar 9, 16, 30-**89**
EDGAR Thomson, genesis of, Shinn *Am Min* * v 19-**91**
FUELS, feasibility of using cheaper, Wainwright *Am Min* * v 17 -**89**
GASES, expts. on, Whiting *Am Min* * v 20 -**92**
GREAT Britain *The Eng* Oct 12-**88**
HEARTH and bosh walls preservation, Gayley *E & Min* * Feb 20-**92**
HEAT-balance, Ledebur, Nitze *E & Min* Jan 30-**92**; heat cals. and dimensions of chimneys, etc. for firing boilers, Roberts *Am Min* v 17 -**89**; development and appropriation of heat, Wright *Eng* Jan 3-**90**. See also BLAST fur. temperature

Blast furnaces, HOT blast stoves, regen., operating, Wainwright *Am Min* * v 17-**89**; Massick's & Crooke's, Am. pat. fire-brick * v 19-**91**
LEAD furnace, stone coal in, Neill *Am Min* v 20 -**92**
LININGS imp., steel and melting, Elbers *Sc Am Sup* Dec 17-**92**
LOW Moor, Va., flue dust of, Means *Am Min* v 17-**89**
MAGNESITE, use as refractory material, Sorge, abs. *Inst C E* v 92 -**88**, *Stahl & Eisen* v 7 -**87**
MONONGAHELA Fur. Co., McKeesport, Pa. *Eng* * July 29-**92**
ROCK-drill for opening tapping-hole, Baker *E News* * Nov 3-**92**
SHEFFIELD, Ala. inset *Eng* * Oct 24-**90**, *Sc Am Sup* * Dec 6-**90**
SLAGS, sulphurous and desulphurous, Elbers *E & Min* June 8, 22-**89**; utilization and disposal, Hawdon *Eng* Feb 19-**92**, do. insets *Inst M E* * Feb -**92**, do. *Sc Am Sup* Apr 2-**92**, *Iron*
SILICA determinations in cinder, C. Jones *Am Min* v 16 -**88**
STOCK hoist, aut. inclined, Pioneer Min. Co. *E News* * Feb 28-**91**
TEMPERATURE determination, Ledebur *E & Min* Aug 22-**91**. See also BLAST fur. heat
TUYERE slagging-valve, Cook *Am Min* * v 17 -**89**
UNION Steel Co., record *E & Min* Feb 18-**88**
WARWICK anthracite and coke, separate and mixed in, Cook *Am Min* v 17 -**89**
Blasting, big quarry blast, So. Beth. N. Y. *E News* * Sep 21-**89**; large masses of iron and steel, abs. *Inst C E* v 100 -**90**, * *Woch ost* -**90**. See also EXPLOSIVES; MINING; QUARRYING; TUNNELING
Blatchley, Charles G. *Inst C E* v 91 -**88**
Bleaching ap., Cloudman *Sc Am Sup* * Oct 3-**91**; of cotton, Apr 2-**92**
Blindness and the blind, Fox *F Inst* June, * July -**89**
Block, Weston's Triplex spur-gear *E & Min* * May 31-**90**, *R Gaz* * May 30-**90**
Blood, gases of the, McKendrick (full) *Sc Am Sup* Jan 5-26-**89**; blood-cells, white, function of, Jordan *Tech Q* May -**90**
Blow, Albert A., por. *E & Min* * Aug -**91**
Blow, a knock out *Sc Am Sup* * Nov 15-**90**
Blowers and fans, expts., Snell *Am M E* v 9 -**88**; fan pressures, ed. *The Eng* Oct 5-**88**, fan effic., Cherry, cor. * Jan 11, Lodge 18 * 25, fan phenomena, ed. * Feb 1, 1, Unwin, cor. 8,

Blowers and fans
Lodge cor. 15, Bower, cor. * Mar 8, etc. -**89.** See also ATMOSPHERIC resistance
ATKINSON'S rotary blower *The Eng* * Oct 21-**92**
BLACKMAN air propeller *Eng* Feb 24-**88**
CAPELL fan, expts., Bochet *The Eng* Oct 26, Nov 23, Dec 7-**88,** * Jan 11-**89**
CENTRIFUGAL ventilators, Norris, table *Eng* Mar 4, * 18, * Apr 22-**92**; blower expts., Isherwood *F Inst* Apr -**89**
ROOT'S blower *Eng* * June 29-**88,** *The Eng* Aug 17-**88**
Blowing engines, blast furnace, Gordon *Am M E* * v 12-**91,** *Cassier's* * Feb -**92,** *E News* * July 1-**91**
Blow-pipe tests (various subs.), Moses *Sc Am Sup* June 20-**91,** *Sch of Mines Q*
Blue print processes, etc., and large photos., Thurston *Am M E* * v 9-**88**; blue proc. formula *E News* June 16, ap., Ingoldsby * Aug 11, pneu. frame * Dec 15-**88**; frame *E Rec* * Dec 3-**92**; large, Cleave's method, Thurston, abs. *Inst C E* v 91-**88,** *Am Machinist* June 25-**87**; ap., Rockwood *R & Eng* * Oct -**91**; reversed, Pellet's proc. *R Gaz* Feb 21-**90**; Bradford *Sc Am* Sep 8-**88**; cyanotype positive proc., Waterhouse (full) *Sc Am Sup* Jan 5-**89**; violet, red and green prints, Estabrooke, Photog. in Studio and Field, bk. review, abs. Mar 15-**90**
Bluestone quarrying, U. S., Day, cen. bull. *E & Min* June 6-**91**
Boats, diving *Eng* Aug 9, 23-**89**; driving by water-jets, etc. *Sc Am* Feb 9-**89,** *Mechanics.* See also FERRY-BOATS; LAUNCHES; LIFE-BOATS; STEAM-BOATS; TORPEDO BOATS; TUG-BOATS: YACHTS, etc.
Bodley, Rachel L. *F Inst* July -**88**
Bohemia, Pribram, mines and mills, Meier *E & Min* July 2, 9 16-**92**
Boilers, Steam, Manual of, Thurston, Wiley, N. Y. -**88,** bk. review *R Gaz* Apr 13-**88**; some preventable wastes of, Kent *Cassier's* Jan -**92**; Steinmüller, Frankfort elec. exhib. *Eng* * June 5, Kuhn do. * 12-**91**; designing *Locom* July, J. Allen (full) Aug * Sep * Oct -**88**; cals., etc. *Pwr* Jan-Mar -**89,** largest in world, Lorillard Tob. wks., Jersey C., White * Apr, Apr -**90**; types, various, relative merits, Golding *Sc Am Sup* Oct 27-**88,** governing proportions of, Emery (full) * Mar 2, 9, safe for amateur work (various types), Hiscox * June 15-**89**; heat transmission in, Hudson *The Eng* Dec 5, 12 * 26-**90.**

Boilers, steam

See also LOCOMOTIVE–MARINE–PORTABLE–ROTARY boilers, etc.

APPLIANCES, boiler and engine room *Pwr* * Jar.– * July– * Sep – * Dec –**90,** * Jan– Apr * June– * Dec –**91.** See also BOILERS, gauges—safety valves, etc.

BABCOCK & Wilcox. See under BOILERS, tests; BOILERS, water tube

BELPAIRE fire-box, 90-in., for Cal. & Hecla Mining Co. *R Gaz* * Mar 21–**90**

BIETRIX's, Batault, abs. *Inst C E* v 92 –**88,** *Compt R* Sep –**87**

BLOW-off cock *Eng* * Jan 17–**90**

BRACING, steam domes *Locom* * June * July –**90**; heads, May –**88,** Aug –**89,** *Pwr* * May –**90,** * Sep –**91.** See also BOILERS, strength

CIRCULATION of water in, effect of on quality of steam, Barrus *Am M E* v 9 –**88**; Babcock *E Rec* * May 16–**91,** *Sc Am Sup* * Apr 12–**90**

COMBUSTION with natural and forced draft, Spence *Eng* Feb 10 * 24 * Mar 2–**88**

COMPLETE combustion, Loughran, cor. *Pwr* Sep –**92**

CONNECTION of steam mains to *Locom* * May, arr. of steam pipes * Aug –**92**

CORLISS vertical, Wamsutta mills, New Bedford *Pwr* * Jan –**91**

COVERINGS, non-conducting, Collins *E Rec* Oct 31–**91.** See also STEAM-pipe coverings

DAMPER regulator, Mason's *E & Min* * Jan 18–**90**

DANGER signals, Grimshaw *E Mag* May –**91**

DURDON compound *R & Eng* * Mar –**92**

DEPOSITS in, use of crude petroleum, Lyne *Am M E* v 10 –**89**; Lewes *Eng* Mar 27, May 1–**91**; do. *Sc Am Sup* May 30 –**91,** do. *The Eng* Apr 3–**91**; pumping solvents into *Locom* July –**88**; scale, composition, Stillman *R Gaz* Apr 4–**90**; feed waters and incrustation, Silvester *Sc Am Sup* Oct 22–**92.** See also BOILERS, kerosene in

DETERIORATION of, J. Allen *Sc Am Sup* * June 9–**88**

DOWNWARD draft furnace, test, Galloupe *F Inst* Feb, Lozano, cor. May –**88.** See also BOILERS, tests, downward draft

EXPLOSIONS, Thurston, bk., Trübner, Lond., Wiley, N. Y.; Daniels *Am M E* * v 13 –**92,** *E News* * Dec 15 *Iron Age* * Dec 8–**92**; J. Allen *Cassier's* * Jan, peculiar, Daniels * Dec –**92**

Boilers, EXPLOSIONS

Eng the Dudley, Jan 20, at Friedrichshütte * Mar 30, in '87, Marten * May 11, 18-**88**, do. * July 12-**89**, do. * July 18, at Crosby and Halifax, Apr 25-**90**; in '90, Marten * Oct 23-**91**. See also BOILERS, tests, red-hot furnace crown expts.

E News English, in 1887 and for 15 years, table, June 9, 9 -**88**; record of, Hartford Ins. Co. reports *Locom* files **88**—**92**; Friedrichschütte great, June -**88**; causes and remedy, Wright, May -**89**; since 1879, table, June; causes, Thwaite * Sep -**91**; '91, summary, Feb -**92**; a cause of, Fowler *R &* *Eng* May -**90**; Warren Springer, Chic., Nagle *R Gaz* * Feb 19-**92**; *The Eng* Jan 15-**92**

FEED-water heaters, Cotterill *Eng* May 2, Maclaine's internal * June 13, Monson's * July 4-**90**; per cent. of saving by, table *Pwr* Apr -**90**; Thomson's *The Eng* Jan 27-**88**; and condens. ap., Naval exhib., Lond. * July 31-**91**

FIRE-box and grate, Cohen's *R &* *Eng* * Oct -**92**

FIRING, Hammond *El Wld* Mar 5-**92**; econom., expts., Bird *Eng* Dec 6-**89**; with soft coal *Locom* * Oct -**89**

FITTINGS, combination *Eng* * June 22-**88**. See also BOILERS, appliances—gauges, etc.

FLOAT, Wright's *E News* * Aug 9 -**90**

FLUES, strength of, D. Clark, cor. *Eng* Sep 21-**88**, *Locom* * Oct -**92**. See also BOILERS, tubes

FORCED draft, construction for *Eng* * Mar 20-**91**. See also BOILERS, furnaces, steam jets; MARINE boilers, do. Yarrow

FRONTS *Locom* * Sep * Dec -**90**

FURNACES and flues, cylindrical, safe working pressures for, Longridge *The Eng* Sep 21-**88**, a new system of generating steam, R. Scott *E News* July 28-**88**; corrug., Milburn pumping station, Brooklyn water-works * Mar 12-**92**; Donnelly fire-grate *R Gaz* * Jan 6-**88**; external *Locom* * Mar -**91**; downward draft, test, Galloupe *F Inst* Feb, Lozano, cor. May -**88**; flue gases *Eng* * Oct 3, 10-**90**; Godillot's, Paris exhib. * Sep 20-**89**; for liquid fuel, Busley *Pwr* * June * July -**88**; the Murphy * Apr -**89**; the Perret, for small coal *The Eng* * Feb 8-**89**; Roney stoker, See BOILERS, stokers

SMOKE preventing *E &* *Min* Aug 6-**92**; Vulcan aut. *Pwr* * Nov -**90**; Ackroyd-Willoughby's, trial *The Eng* * May 15-**91**; Sennett, n * Aug 26-**92**. See also SMOKE prevention

STEAM jets for forced draft in, expts. *E News* Apr 4 * Sep 19-**91**; temp. of fire surfaces *R Gaz* Nov 22, Dec 13-**89**

Boilers, FUSIBLE plugs, Bailey's *R Gaz* * July 13-**88**; *The Eng* Sep 28-**88**
GAUGES, water, Hopkinson safety *E News* * Jan 2-**92**, *Eng; R Gaz* * Oct 5-**88**; fittings, Gray *The Eng* Jan 22-**92**
HAZLETON (Porcupine) vertical *Pwr* * June -**88**, *St R J* * Aug -**89**
HIGH pressure, prog. in generating, Babcock *Cassier's* * June -**92**; Thwaite, cor. *El Rev Lond* Dec 9-**92**; with forced draft, Turner *The Eng* July 20-**88**
HIGH water indicator, Schwarzkopff's *E News* * Nov 1-**90**
HORSE power (full) *Locom* Jan -**92**, com. rep. *Pwr* Sep -**90**
HOUSE, economy, Little, cor. *The Eng* Oct 9-**91**
HUDSON river, State Asylum, Poughkeepsie, N.Y. *Pwr* * July-**89**
INSPECTION, and registration bill, English, '91 *Eng* Mar 13-**91**; Am. reports, Hartford Steam Boiler Insp. & Ins. Co. *Locom* files **88—92**; insurance and Bd. of Trade *The Eng* Sep 28-**88**
KEROSENE oil, use in, for preventing formation of scale, Lyne *Am M E* * v 9 -**88**, Carpenter, n v 11 -**90**, *E News* May 24 -**90**, *E Rec* Dec 31-**87**, *Sc Am Sup* Feb 11-**88**
LANCASHIRE, evap. of, Longridge *Eng* Apr 11, 18-**90**, do. *The Eng* * Feb 14-**90**, Nov 6-**91**; three-flued, trial, Crossland, Mar 11-**92**; mod., Boswell *Eng* Oct 30, construction do. * Nov 20-**91**, do. discuss., insets *Inst M E* * Oct -**91**. See also BOILERS, tests, Lancashire
LENTZ'S stayless *Eng* * Dec 19-**90**
MAKING machinery *The Eng* * Dec 26-**90**
MANCHESTER Steam Users Assoc. report *E News* July 19-**90**
MAN-hole and steam nozzle locations *Locom* June -**89**
MECHANICAL stokers. See BOILERS, stokers
OIL burner *R & Eng* * Apr -**88**. See also MARINE boilers, liquid fuel
PLANTS, see STEAM plants
PLATES, welding and flanging *Cassier's* Nov -**91**
RIVETED joints, longitudinal, Cooper *Am M E* v 10 -**89**, do. *F Inst* Aug -**89**; Le Van * Apr * May -**91**; expts., Kennedy, report, insets *Inst M E* * Oct -**88**; Cooper *Locom* Apr -**88**, July -**89**, and seams, strength, Cooper * Sep, strains * Oct * Nov -**90**; Allen (full) * July * Nov -**91**; double seams, Ruggles *Pwr* June -**90**; Le Van (full) * Aug, J. Allen * Nov -**91**; Le Van *Sc Am Sup* * July 4, 11-**91**. See also BOILERS, strength

Boilers, ROTARY, connections for, *Locom* Jan -**88**
SAFETY valves, cals. *Locom* May -**88**; and levers *Pwr* * Oct -**91**; springs, diag. for cal. *The Eng* * June 26-**91.** See also SAFETY valves
SCALE, composition, Galveston ,Tex., Kœnig *F Inst* Aug -**91**
SCHALEHN'S fire-bridge *The Eng* Jan 13-**88**
SELLERS. See BOILERS, water-tube, Seller's
SEMI-locomotive *El Rev Lond* * May 27-**92.** See also PORTABLE boilers and engines
SERPOLLET'S instantaneous generator, *El Wld* * Nov 23-**89**; Kennedy, expts. *Eng* Sep 18-**91.** See also STEAM carriage, Serpollet's
SETTINGS, (external furs.) Willimantic I & Steel Co. *E News* * Oct 13-**92**; over a single furnace *Locom* Apr -**89**; numbers of bricks in, Nov -**91**; *Pwr* Aug -**90**
STEAM drums, attachment of nozzles to *Locom* Feb -**88**; dome bracing * June * July; nozzles attach. * Aug -**90**
STEAM pipes connections *Locom* * Aug -**90**
STRENGTH of shells, expts., J. Scott *Eng* * Apr 26-**89**; stay, Yarrow's tubular * Nov 7-**90**; short, strength of * Apr 17, cor. * May 15-**91**; stay-bolts prob., ed. *E News* Mar 21-**91**; new steel boiler, expt. test, Scott *Locom* June -**89**; heads, unbraced wrt. iron * Feb; hydr. tests, Nov -**90**; bursting pressure * Feb, stayed surfaces (full) * Mar -**92**; bracing and stay-bolts *Pwr* * Sep -**91**; bursting pressure of cylindrical *Sc Am Sup* * Mar 26-**92.** See also BOILERS, bracing—riveted joints
STOKERS, aut. conveyor *Eng* * June 14, 28-**89**; plant with, Curtis Davis, Cambridge, Mass. *E News* * Dec 1-**92**; machine stoking, discuss., insets *Inst C E* * v 104 -**91**; Roney stoker *Pwr* * Aug -**89**; mechan., Whitham (full) * July -**91**, Roney *St R J* * Aug -**89**; mechan., Roney (full) July -**91.** See also MECHANICAL stokers
TESTS and trials, expts., Donkin *Eng* July 4 * 18 * Aug 1 * Nov 21-**90** * Feb 27, May 15 * Oct 2-**91** * Mar 18 * July 22 * Oct 21-**92**; and fuel econ., Holliday, inset *Inst C E* * v 92-**88**; overheating expts., Hirsch, abs. v 108 -**92**, *Bull Soc E Socs* -**90**; Otis Co's mills, Ware, Mass. *Locom* * Mar, equiv evap. Apr -**90**; clean and foul boilers, comparative, July -**92**; duty. factors of evap., table *Pwr* Feb, Mar, May, Sep -**89**, how conducted * July -**92**; Barrus, bk. review *R & Eng* Apr -**92**; with natural and forced draft, Spence *The Eng* Feb 17-**88**

Boilers, tests, BABCOCK and Heine, comparative, Emery, report *St R J* Apr -**92**
BABCOCK & Wilcox, Longridge, report *Eng* * July 11 * Dec 19-**90**
BLAST furnace waste gas as fuel, effic., Jacobus *Am M E* v 17 -**89**
COIL boilers, Gov't. *E News* Oct 13-**88**; Ward's coil, U. S. Navy * Aug 29-**91**
DONNELLY'S pat. grate, Schneider, abs. *Inst C E* v 92 -**88**, *Zeit Dampf* -**87**
DOWNWARD draft, Complete Combustion Co.'s tubular, Galloupe *E News* Mar 23 * Sep 7-**89**, Galloupe *F Inst* Feb, Lozano, cor. May -**88**
LANCASHIRE, evap. of, Longridge *Eng* Apr 11, 18-**90**, do. *The Eng* * Feb 14-**90**, Nov 6-**91**; three-flued, Crosland, Mar 11-**92**
OVAL, two-flues, evap., abs. *Inst C E* v 91 -**88**, *Zeit Verb Dampf* -**87**
PORTABLE, W. Webber *Am M E* * v 13 -**92**
RED-hot furnace crown expts., McKean *Cassier's* Jan -**92**; do. explosions *Eng* Jan 30 * Feb 13 * Mar 6, 13 - Apr 17-**91**, do. *Pwr* * Nov -**90**
STEEL, open-hearth, use and testing for, Goodall, discuss. (full) *Inst C E* * v 92 -**88**
WARD'S sectional *Eng* * Apr 5-**89**
WATER-tube, Knap *The Eng* May 25-**88**
TUBES, leaky *Pwr* * Sep -**92**; Serve's ribbed *Eng* * Mar 22-**89**, Oct 24, 31-**90**, *E News* * Nov 8-**90**, * May 9-**91**, *R & Eng* * Aug, *R Gaz* May -**91**, *The Eng* * Apr 19-**89** * Oct 31-**90**
WATER-tube, Babcock & Wilcox, test, Longridge *Eng* * July 11 * Dec 19-**90**, Dec 23-**92**; Thornycroft, abs. *Inst C E*, *R & Eng* Feb -**90**; Almay's, corrug. mul. steam gen. *Pwr* * Oct, Oct -**90**; Seller's * Oct -**91**; circulation in, Krauss * Dec -**92**; Sibley coll., Thurston *Sc Am Sup* * Apr 14-**88**; Yarrow's *The Eng* * Jan 16; Mill's * Dec 4-**91**. See also MARINE boilers, water-tube
Bolden, Henry *Inst C E* v 109 -**92**
Bolivia, mineral resources, Minchin *Eng* * July 11-**90**, Apr 17-**91**
Bolton, Francis J. *Inst C E* v 93 -**88**
Bolts, drift, holding power, expts. *E News* Feb 28-**91**, *E Rec* Nov 29-**90**

Book binding machinery, Paris exhib. *The Eng* * May 3-**89**
Book-keeping, Child *E Mag* Aug -**91**
Books, in library *F Inst* Sep -**88.** See also BIBLIOGRAPHY: ENG. literature; INDEXES, etc.
Booth, J. C. *F Inst* July -**88**
Boothby, Alexander C. *Inst C E* v 97 -**89**
Boots and shoes, manuf. of, Rich *Pop Sci* * Aug -**92**
Borax, history in U. S. *E & Min* Sep 10-**92**; manuf., Witting, Dec 22-**88,** *J Soc Chem Ind;* California, Hake (full) *Sc Am Sup* * Jan 18-**90**; sources and applics., Fleming, July 4-**91.** See also under CHEMISTRY
Boring machine, for angular holes *E News* * Mar 21-**91**; hand power diamond (for ore deposits), Nordenström, abs. *Inst C E* v 99 -**90,** *Jern Kontorets An* -**88,** *Oest Zeit Berg* v 37. See also DRILLS; MINING; QUARRYING
Boston Heating Co's plant, Abbott, insets *Am Min* * v 16 -**88,** *Eng* * Aug 30, * Sep 6-**89**
Boston, Mass., U. S. *Eng* * June 15, 15, 22, 29-**88**; harbor improvements *E News* Sep 22-**88**; houses, tenement, Mar 2-**89**
MUNIC. eng., City eng'r's rep. '89 *E Rec* Apr 5-**90**; parkways, road and drainage construction *E News* * Sep 15-**88**; passenger traffic *R Gaz* June 17-**92**
RAPID Transit Commission rep. to Mass. Legislature, Apr 5-**92,** abs. *St R J* May -**92**; proposed sys. *E News* Mar 14, European practice, Howes, Dec 5-**91**
STREET pavements *E News* May 12, st. sprinkling, June 2-**92**; st. dept. report *E Rec* Apr 23-**92**
Bottle manufacturing by machinery, glass, Ashley *Eng* * Oct 11-**89**; do. German, Partello *Sc Am Sup* June 30-**88**
Boulanger, General, por. *Sc Am Sup* * July 7-**88**
Bourdeaux, John *Inst C E* v 104 -**91**
Bower, John *Inst C E* v 92 -**88**
Box nailing machine, Hodge's *Eng* * Mar 29, 29-**89,** *The Eng* * Mar 22-**89**
Brain, cerebal radiation, Houston *El Rev* June 4, *F Inst* June; discovs. in anatomy and physiology of, Putnam *Tech Q* Apr -**92**
Brakes, Carter *El Rev Lond* * July 8-**92**; Prony brake, horse power characteristics, Crane *El Wld* * Mar 15, 22-**90,** do. *Pwr* Feb, June * Nov * Dec -**88.** See also ENGINES, brakes; RAILROADS, brakes

Bramwell, George W. W. *Inst C E* v 109 -**92**

Branner, John C., por. *E & Min* * Dec 12-**91**

Brass foundry building, Nat. Meter Co., Brooklyn *E Rec* * June 18 * Sep 10-**92**; (locom. construction) *The Eng* Oct 21 * Nov 4 * Dec 30-**92**

Brazil, Ivins *Sc Am Sup* Jan 4-**90**

Brewery, Guinness' *Eng* * Sep 14, 28, tramways, Georghegan * Oct 12-**88,** do. St. James Gate *The Eng* Aug 24, tramways in, 31, 31-**88,** do. Dublin *Sc Am Sup* Dec 1-**88**

Brewing, Paris exhib. *Sc Am Sup* * May 10-**90,** *Genie Civil;* Trades exhib. *The Eng* Nov 2-**88**

Bribner, Alan *Inst C E* v 101 -**90**

Brick, law of crushing strength, Baker *E News* Feb 2-**89**; brickwork, to estimate, n Oct 12-**89**; permeability, expts., Hale * Jan 3, 10; nomenclature, com. report Mar 7-**91.** See also PAVEMENTS, brick

MAKING industry, manufacture about N. Y. city, Tomkins; near Chic., Purington; slate, Villalon; in Sinaloa, Mex., Avela, *Am C E* v 18 -**88**; and pavement, discuss., Calkins, insets (full) * v 26 -**92**; Davis, bk. review *E & Min* Dec 21-**89**; oil vs. coal for burning, Crafts *E News* Feb 2-**89**; Hudson river *Sc Am Sup* Nov 8-**90**; machinery, Bale * Feb 8-**90,** *Bld News;* do. Craven, stiff plastic *The Eng* * July 25-**90**

Brickenden, James G. *Inst C E* v 92 -**88**

Bridges, *Eng* spec., Am., Pencoyd Iron Works, Dec 7, 21 -**88**

E News the world's great, and North river, proposed * Jan 14; wts. of, formulas, Mosscrop, Mar 17-**88**; live loads and wts. of, Pegram, ed. * Jan 10, 10; and trusses, skew pin connections, imp. in, Steiner * Oct 17 * Dec 26-**91**; soft steel in, Lewis, Nov 7-**91,** Jan 16, Mar 26-**92**

E Rec soft steel in, Lewis, Mar 12-26, Apr 2-**92,** do. Bischoff, Krohn, abs. *Inst C E* v 107 -**92,** *Zeit ost Ing* -**91**

R Gaz development of iron, Whipple * Apr 19; eye-bars, wrt. iron and steel, tests, Gaylor * May 10-**89,** *J Assoc Eng Socs;* long plate girder (115-ft.), econ., G. Thomson * May 23 -**90**; details, Swensson, Feb 26; disputed points in designing, Waddell, cor. Sep 9, 23-**92**

The Eng staging for erection, June 8-**88**; highest viaducts in world (list), June 10-**92.** See also BRIDGES, draw-bridges, highway, railroad

Bridges, AARE, Coblentz, pneu. foundations *E News* * Apr 9-**92**
ACCIDENTS, failures, Am., G. Thomson *Eng* * Sep 14-**88**; Apple river, fall *E News* Mar 31; Arcole Apr 14-**88**; wreck of Browning's trestle, Vir. Midland, Thornton, cor. *R Gaz* * July 20; railroad bridge failures, G. Thomson, and ed. *R Gaz* Sep 28, Oct 12-**88**; the Mœnchenstein, Basel, Switz. (full) *E News* * Aug 1, ed. 8, Dec 26-**91**, do. *R Gaz* * July 17-**91**, do. *The Eng* * Dec 4, 11-**91**, Ende * Feb 19-**92**. See also RAILROADS, accidents
ALBANY, N. Y., Hawk st. viaduct *E News* * Feb 16-**89**
ALOGOAS Ry., Brazil *E News* * July 25-**91**
AMERICAN, and English, Fidler *Eng* Nov 9, Dec 7, 21, 28-**88**, new, ed. Oct 3-**90**; table, Berkley *Inst C E* v 107 -**92**; French engineer on, Le Rond *R & Eng* Sep -**89**, *An Ponts*
AQUEDUCT truss *E Rec* * Mar 14-**91**
ARAUCO R and Bio-Bio, Manby *Inst C E* * v 108 -**92**
ARCHED, *Eng* pressures on voussoirs and abutments, Paterson, cor. * Dec 14, joints, pressures, Trautwine * 21-**88**
E News stone, Springfield, Mass., proposed * May 12, June 2, Herschel, July 28 ed. Aug 4 * Nov 3; skew or spiral, Paret, Cin. & Rich. R. * Oct 20, 27, Nov 3-**88**, Johnstown ribbed arch, Pa. * July 20-**89**; Conemaugh, Penn. Cen. R. * Mar 29; stone, Elyria, O. * June 21; ribbed steel, Rock Lane, New Haven, Ct., Hill * Aug 16-**90**; stone, Falls of Schuylkill, Phil. & Reading R. * Jan. 24; stone, Elkader, Ia., Turkey river * Apr 11; Monier method of constructing, Berlin * May 23; stone, with lead joints at key * Oct 24-**91**; New Brunswick, N. J., Albany st. masonry arch * Apr 16; Gour Noir viaduct, Vegere river, Uzerche, France, inset (full) * Aug 18; Mt. Vernon viaduct * Sep 1-**92**
E Rec St. Paul, Col. st. skew arch * Nov 23-**89**; Minneap. steel * May 10-**90**; stone park, Prov. * July 23-**92**; skew arch course traces, Haines *Inst C E* v 105 -**91**; German construction with hinged arches, Riviere, abs. v 107 -**92**; *An Ponts* June **91**; Monocacy Creek stone, sidewalk, Beth., Pa., Grossart *Lehigh Eng J* Apr -**89**; Wheeling, W. Va., 158-ft. *R Gaz* * Aug 15-**90**. See also ARCHES
ARTHUR Kill draw-bridge, Staten Is. Rap. Tran. Co. *R Gaz* * June 22-**88**, * July 26-**89**
ASSAM suspen., Doyong river *The Eng* * Aug 15-**90**
AUSTRIA iron, renewal, Huss, abs. *Inst C E* v 98 -**89**, * *Zeit ost Ing* -**89**

Bridges, BALTIMORE, Md., Cedar Ave. *R Gay* * Sep 18-**91**
BATTERSEA, England, inset *The Eng* * July 25-**90**
BEARINGS, fixed and expan., Sinot-Pichin R. *The Eng* Oct 12-**88**
BEAVER river plate girder, Pitts. & L. Erie R., inset *E News* * Apr 2-**92**
BELAJA river, Samara-Ufa R., Russia, inset *Eng* * July 11, 25 -**90**
BERLIN, the Moltke, Pinkenburg, iron tilt do., abs. *Inst C E* v 92 -**88,** *Deut Baus* -**87**
BERLIN Iron Co. plant, E. Berlin Ct. *E News* * Oct 3-**91**
BIG Warrior river, Memphis & Birm. R., Cordova, Ala. *R Gaz* * June 29-**88**
BINGHAMPTON, N. Y., Court st., erection *E Rec* * Mar 8-**90**
BISMARCK, erection *E Rec* * Nov 3-**88**
BLACKFRIARS, Lond. Chat. & Dover R., Thames river, Cruttwell *Eng* May 7-**90**
BOAT, Indian, Fenner *R & Eng* * Sep -**88**
BOSTON, Mass., Boylston st., over B. & A. R. *E News* * May 25 -**89,** do. erec. *E Rec* * June 8, 22; Harvard, erec. * 29-**89;** Bussey, Robbins *Tech Q* * Sep -**87**
BOWSTRING, inverted, Bosman St. R. *E News* * Oct 6-**92**
BROAD & James river, erection *E Rec* * Feb 7-**91**
BROCHOCKIS portable *Eng* * Apr 5-**89**
BROOKLINE, Mass., plate girder highway, inset *E News* * Sep 19 -**91**
BROOKLYN and N. Y., (East River) suspension *Eng* traffic * July 27-**88,** Oct 24-**90**
E & Min problem, Apr 28-**88,** (terminals) inc. of carrying capac., Wellington * Apr 5-**90,** problem * Jan 17-**91**
E News growth of traffic * Feb 11, enlarging capac., report of bd. of experts and eds., with inset map of residence areas * Mar 17, 24, terminals, report Apr 21, adopted plans for, C. Martin, Wellington and eds. * 28, do. discuss. *Brooklyn Eagle* 28-**88,** terminal plans *E News* * Jan 11, Mason, cor. * Mar 8, problem May 3-**90,** new terminals, report * Jan 17, enlarging capac., ed., diags. and second report * Feb 14, 14, 28, cor. * Mar 7, cor. * 21-**91**
E Rec terminal facilities, com. rep. Jan 17-**91,** * Sep 24, operation, diag. * Dec 17-**92**
R Gaz terminals, proposed * Dec 27-**89,** report, Dec 11-**91,** traffic, Cable Co., table, Oct 28-**92**

Bridges, BROOKLYN

St R J bd. of experts report * Feb -**91,** report, Jan -**92.** See also CABLE railroads, Brooklyn bridge

BUFFALO Trace, viaduct Ky. Midland R. *E News* May 25-**89,** erection *E Rec* * Dec 14-**89**

BUENOS Ayres & Valparaiso Transandine, Jackson, inset *Inst C E* * v 109 -**92**

BUILDING, combination on Pac. coast, Ottewell, insets *Am C E* * Oct 27-**92**; construction, iron and steel, Fidler, bk., Griffin & Co., Lond. -**87**; history, Manners *Eng* * Jan 1-28 * Feb 5-26 * Mar 4, 11-**92,** do. *E Rec* Jan 30, Feb 13-27, Mar 5, 26, Apr -**92,** do. *Sc Am Sup* * Mar 12, 19 * Apr 16, 23 * May 7, 14, 28, Aug 6-**92**; in Am., T. Thomson, insets *E Mag* * Oct -**92**; rivets, conventional code for, Ferris, cor. *E News* * Jan 26-**89**; England and U. S., prices, Dec 15-**92**; erection, European methods *E Rec* * Mar 1-**90**; development, Trowbridge *Sc Am Sup* Mar 17-**88,** *N Y Acad Sci,* do. Swain *Soc Arts Mass* -**88**

BULL Creek, Paola, Kan., Kan. C. Fort Scott & Memphis R. *E Rec* * Mar 5-**92**

BUSSEY, Robbins *Tech Q* * Sep -**87**

CAIRO, Ohio river, Ill. Cen. R., substructure, inset *E News* * Feb 7-**91,** *R & Eng* Dec -**89,** *R Gaz* June 1-**88**

CAPUTH ferry, Tay river *Eng* * Sep 13-**89**

CASCADE, Sears, cor. *E News* Sep 1, Oct 6-**88**

CEREDO, Ohio river *E News* * May 17-**90**

CERNAVODA, Danube river, Roumania, proposed *E News* * Aug 23-**90**

CERVEYRETTE gorge, Briancon, France, inset *E News* * June 9-**92,** *Sc Am Sup* * May 21-**92**

CHATTANOOGA, Tenn., Walnut st., inset *E News* * May 16-**91**

CHENAB, Indian State R. *The Eng* Sep 14-**88**

CHESAPEAKE & Ohio, Ohio river, Burr, inset *Eng* * Dec 5-**90**

CHICAGO, Ogden Ave. viaduct, inset *E News* * Feb 6-**92**; draw-br., Madison st., inset *R Gaz* * Mar 11-**92**

CHICAGO, Bur. & Northern *E News* * Apr 7 * May 5, June 9-**88**

CHICAGO, Bur. & Q. R. standard double track *E Rec* * Oct 6-**88,** * Jan 26 * Feb 9-**89**

CHICAGO, Mil. & St. P. R. pin bearing plate girder *E Rec* * Nov 21-**91**

Bridges, CHICAGO & No. Western R. thin floor plate girder *E News* * Apr 9-**92**

CHICAGO & Western Indiana Belt R., 105-ft. double track through span *R Gaz* * Oct 30-**91**

CHITTRAVATI river, Madras R., India, Stoney *E Rec* * Apr 30 * Aug 6, 13 * Nov 12-**92**, and discuss., insets *Inst C E* * v 103, 104 -**91**

CINCINNATI & Covington elevated R. Transfer & Br. Co., river spans of, Burr, insets (full) *Am C E* * v 23 -**90**, (full) *Sc Am Sup* * Dec 13-**90**

CINCINNATI & Newport *E Rec* Sep 10, Nov 5 * 19 * Dec 31 etc. -**92**

CLARENCE, Taff river, Cardiff, So. Wales, inset *Eng* * Jan 30 * Feb 13, inset * Mar 6, inset * 20, 20-**91**

CLEVELAND central viaduct *E News* * Dec 22-**88**

CLYDE river, proposed *R & Eng* * Mar -**89**, * *Industries*

COFFER-dam or caisson without timber or iron in its construction, R. Harris, discuss., insets *Am C E* * v 24 -**91**, *R & Eng* May -**91**

COLORADO river cantilever, Cal. & Ariz. R. *E News* * Feb 23 -**89**

COLUMBIAN exhib. steel canal *E News* * Apr 21-**92**

COLUMNS, z-iron, expts., Strobel *Am C E*, *R Gaz* July 13-**88**

COMPRESSION members, Bess. steel, expts., Dagron, discuss., insets *Am C E* * v 20 -**89**

CONEMAUGH arch, Penn. Cen. R. *E News* * Mar 29-**90**

COTEAU, St. Lawrence river, Quebec, Can. Atlan. R. *E News* * Apr 12-**90**, machinery for swing span, inset * May 30, 30 -**91**, construction, Mountain, abs. *Inst C E* v 109 -**92**, *Can Eng* -**91**. See also BRIDGES, draw-bridges

CRIB, Salisbury & Haney R., N. B. *E News* * June 7-**90**

CRUEIZE viaduct, Marjevois, So. France R., n *R & Eng* * Mar -**91**, * *Genie Civil*, *The Eng* * June 5-**91**

CUMBERLAND, Md., Balt. st. *E News* * July 21-**92**

DALMARNOCK, Glasgow, inset *Eng* * Mar 28-**90**

DELAWARE, Lack. & W., White's plate girder *R & Eng* * July -**91**

DRAW-BRIDGES, swing, turning by elec. power *El Rev* * Apr 20-**89**; hydr. machinery, Fidler *Eng* Feb 19-**92**; end-adjusting gear for, Turner *E News* * Apr 16, vertical lift, method of operating * June 30-**92**; lock, Penn. R. *R Gaz* *

Bridges, DRAW-BRIDGES

July 27-**88**; protection, Boston, Rev. B. & L. R., Hammond, Oct 14-**92**

ARTHUR Kill, Staten Is. Rap. Tran. Co. *R Gaz* * June 22-**88**, approaches * July 26-**89**

BERLIN, Moltke iron tilt, Pinkenburg, abs. *Inst C E* v 92 -**88**

BRIDGEPORT, Ct., elec. operation *El Wld* * Apr 20-**89**

CASTLETOWN swing, Wawn, inset *Inst C E* * v 92 -**88**

CHICAGO river folding, *Eng* * July 24-**91**; swing by electricity *R Gaz* * Aug 21-**91**; Madison st., inset * Mar 11-**92**; Weed st., folding floor *E News* * May 23-**91**

COTEAU, St. Lawrence river, Quebec, Can. Atlan. R., machinery for swing span, inset *E News* * May 30, 30-**91**. See also BRIDGES, Coteau

DEE river swing, Manchester, Shef. & Lincoln R. *The Eng* * Nov 22, 29-**89**

DISMAL swamp canal, Norfolk & W. R., inset *E News* * Nov 3-**92**

DRYPOOL swing, Hull *The Eng* * Jan 3-**90**

DULUTH, Minn., ship canal, designs *E News* * Oct 27-**92**; lift, proposed, inset *R Gaz* * Apr 8-**92**

FLORENCE R., Tenn. river *E Rec* * Feb 28-**91**

FRASER river Howe truss, Can. Pac. R., Cambie *R Gaz* * Nov 25-**92**

GLAMORGANSHIRE canal swing, Cardiff *The Eng* * Aug 7-**91**

HACKENSACK, Erie R. *R Gaz* * July 20-**88**

HARLEM river lift, *R Gaz* June 10, temporary pile supports, Triest * Aug 19-**92**

KIDDERPORE docks swing *The Eng* * Apr 22-**92**

MANCHESTER ship canal swing *Eng* June 6-**90**

NANTICOKE river R., erection *E Rec* * May 16, 23-**91**

NEW London, Ct., Thames river *E News* * Aug 16-**90**

OAKLAND, Cal., accident *E News* * June 7-**90**

PAUMUNKEY river, erection *E Rec* * Feb 14-**91**

PETALUMA *E News* * Oct 13-**88**

POLLET swing, Dieppe, France *R Gaz* * Aug 26 * Sep 9-**92**, inset (full) *The Eng* * July 29 * Aug 5-19 * Sep 9-**92**

TARENTO, Italy *E News* * Sep 13-**90**

THAMES river, New London, Ct., pivot pier *R Gaz* * Nov 7-**90**

TIENTSIN, China R. *The Eng* Feb 3, 24-**88**

WINONA. Minn., swing span, inset *E News* * Oct 17-**91**

Bridges, DUFFERIN, Ganges river, Benares, Oude & Roh. R., India *Eng* * Feb 17, 17-**88,** Walton, Mar 7-**90**; construction, Walton *E Rec* Aug 22 * Dec 19-**91,** Jan 9, 30-**92**; Walton, discuss., insets *Inst C E* * v 101 -**90,** do. *The Eng* Mar 14-**90**

DULUTH, Minn., 6th ave. viaduct *E Rec* * Feb 20, 27, harbor entrance, proposed May 14-**92.** See also BRIDGES, draw-bridges, Duluth

DU VIAUR viaduct, proposed, inset *E News* * Nov 30, 30-**89**

EARN viaduct, Caled. R., Scot., renewal, inset *Eng* * Sep 16-**92**

ENGLISH Channel, proposed, Schneider *Eng* Sep 27-**89,** ed., Aug 7-**91,** * Sep 23-**92**; Talansier *E Rec* * Nov 2, 16-**89,** * *Genie Civil; F Inst* Nov -**89**; *R & Eng* * Nov -**89**; *R Gaz* Oct 11-**89**; Fleury *Rev des Deux Mondes* Aug 15-**92**; Schneider, Hersent, prelim. designs (very full) *Sc Am Sup* * Nov 2, 9, 16 * Dec 21, 28-**89** * Jan 25-**90,** do. *The Eng* * Sep 27 * Oct 4, 11-**89**

ENZ river, Hofen *Eng* * May 6-**92**

FLOATING, Portsmouth & Gosport, Harris *Eng* * Oct 7 *E Rec* Oct 15, *Sc Am Sup* * Nov 19, *The Eng* * Sep 23-**92,** *Inst M E*

FLOORS, wrt. iron double track floor-beam, Boller, discuss., insets *Am C E* * v 18 -**88**; do. *Sc Am Sup* * June 2-**88**; do. *The Eng* Apr 27-**88**; floor-beams and pine stringers for, Bates, dis., insets *Am C E* * v 23 -**90**; Hobson's flooring *Eng* * Nov 29-**89**; iron and ballast floor *E News* * Mar 23-**89** * Oct 27-**92**; solid R. *R Gaz* June 27, ed. Oct 31-**90,** shallow * Sep 11 -**91.** See also BRIDGES, railroad, floors

FOOT-bridges, Oker river, Brunswick, inset *Eng* * Aug 17, inset * Sep 7-**88**; Ouse river, Bedford *Sc Am Sup* * Sep 8-**88**; Kernot, cor. *The Eng* Aug 16 * Nov 15-**89**

FORTH, *Am C E* obs. on, Emery, insets * v 22 -**90**

Eng inset, * Apr 27, May 11, inset, 25, July 6, Aug 10, Cooper 31, Biggart, Dec 14-**88,** compared with Eiffel tower, May 3, inset, Nov 15, inset, 29, Dec 6-**89,** history, Westhofen (very full des.), insets * Feb 28, ed. Mar 7, assessable valuation, Oct 3-**90**

E Mag greatest in world, Clarke * Apr -**91**

E & Min * Mar 15-**90,** * *Industries*

E News * Mar 10, Cooper * Sept 22-**88,** * Feb 9, determination of wind pressure by model, n Mar 16-**89,** inset * Jan 25, 25, testing, Feb 15, notes, Mar 15, final inspection report, Mar 29-**90,** criticisms, Cooper, cor. Lindenthal, Dec 5-**91**

Bridges, FORTH

E Rec Baker * Oct 12-**89**; construction * Sep 6-**90** * Jan 10-**91**

Inst C E hydr. appliances at works, Moir, inset * v 91 -**88**, Austrian prototype of Köstlin, abs. n v 92; Queen's ferry, Nott *Locom* June -**90**

R & Eng description * Feb -**90**

R Gaz Biggart * May 18, erection * July 13, discuss. on bridge steel, Cooper, Sept 14-**88**, *Iron & Steel Inst* Brit. * Nov 15-**89**, *Industries* Oct 11-**89**, wind pressure obs. *R Gaz* Apr 18-**90**

Sc Am Sup Cooper * Oct 13 * Nov 17-**88**, Jan 19-**89**

The Eng Feb 3, Aug 24, Oct 19, 19, Nov 9, 9-**88**, * Jan 11, July 26 * Aug 2, 23, 23, inset * Dec 13-**89**, * Feb 28, opening, Mar 7, Ry 14-**90**

FORT Madison, Miss. river, inset *Eng* * July 19-**89**, *Sc Am Sup* * Aug 31-**89**

FORT Smith R., Ark., piers *E Rec* * Oct 22-**92**

FOUNDATIONS, design, H. Lewis *E News* Oct 17-**91**; repairing, Wash. aqueduct, D. Hunt *E Rec* * Dec 27-**90**; piling vs. mud-sills, Cantine *R Gaz* Sep 9-**92**. See also FOUNDATIONS

GAGNIERES viaduct *R & Eng* * May -**89**

GARABIT viaduct *E Rec* * Mar 7-**91**; Eiffel, abs. *Inst C E* v 95 -**89**, *Compt r* July -**88**

GIRDER, fundamental types of metallic and the cantilever system, Gaudard, abs. *Inst C E* v 106 -**91**, *An Ponts* Mar -**91**; girder tests, Austrian, mild steel *R Gaz* * Nov 27-**91**; girder flanges, lateral stability of *The Eng* * May 29-**91**. See also BEAMS and girders

GLAMORGANSHIRE canal swing, Cardiff *The Eng* * Aug 7-**91**

GLASGOW harbor high level, proposed *Eng* Jan 11-**89**; Glasgow Cen. R., inset * Aug 19-**92**. See also BRIDGES, highway, Glasgow; Railroads, underground, Glasgow Cen.

GLENURY viaduct timber arch *E Rec* * Nov 12-**92**, *Eng*

GREENOCK & Gourock R., inset *Eng* * Feb 22-**89**

GROUSE valley R. *E Rec* * Jan 19-**89**

GOUR Noir viaduct, Vegere river, Uzerche, France, inset (full) *E News* * Aug 18-**92**

HACKENSACK draw-bridge, Erie R. *R Gaz* * July 20-**88**

HARLEM river, N. Y. *E News* * May 26-**92**; *E Rec* * Jan 21, erection * July 7-28 * Aug 11, Sep 1-**88**; lift *R Gaz* June 10,

Bridges, HARLEM
temporary draw-br. pile supports, Triest * Aug 19-**92.** See also BRIDGES, draw-bridges, Manhattan

HAWARDEN, Dee river, Fox *E News* * Sep 15-**92,** inset *Inst C E* * v 108 -**92**

HAWKESBURY R., New So. Wales, Burge *Eng* Mar 7-**90**; motions, observed in, Ewald, cor. * Feb 6-**91,** do. *E News* * Mar 14-**91**; Jan 5, testing, July 20-**89**; erection *E Rec* * May 30 * June 6-**91**; Burge, insets *Inst C E* * v 101 -**90**; placing the center span *R Gaz* * Aug 10-**88**; *Sc Am Sup* * Aug 11-**88**; *The Eng* Sep 7-**88,** June 14, Sep 13-**89,** Burge Mar 7-**90**

HIGHWAY, Cincin. cantilever, Kaufman, insets (very full) *Am C E* * v 27 -**92**; Glasgow road, Grt. West. R., inset *Eng* * Aug 22-**90**

E News Waterford, N. Y. * June 1; iron viaducts for, Waddell, 8; * July 6-**89**; supervision, proposed system, Stowell, Mar 22, 29; legislation, proposed, Breithaupt, cor. Apr 19; designs, Owen, cor. May 10; the bridge of the future, Dibbles * June 21; Guilderland, N. Y. (unsafe), Stowell, cor. * Aug 30; wire suspen., Victor, Cal., etc. * Nov 8-**90**; plate girder, Brookline, Mass., inset * Sep 19-**91**; Rockford, Ill., State st. plate girder, inset * Feb 27; Stearns truss for * July 21-**92**

E Rec viaducts across R. tracks, Gayler, Sep 19-**91,** do. *J Assoc Eng Socs*, iron and steel, Waddell, discuss. Nov -**88,** abs. *Inst C E* v 95 -**89**; floors of st., Gayler, abs. v 93-**88,** *J Assoc Eng Socs* -**88**; Kelvin river road, Glasgow *R & Eng* * Nov -**91**; Niemen river, Olita, Russia * Dec -**92**; 158th st., over N. Y. Cen. R. *R Gaz* * Nov 9-**88**; Nova Scotia * May 3-**89**; over R. tracks, experience with, Gayler, Aug 21 -**91**; brick, Persia *Sc Am Sup* * Dec 31-**92**

HOOGHLEY river Jubilee R., India, Leslie *Eng* Jan 27-**88,** erection *E Rec* * Oct 4, 25-**90,** do. discuss., inset (full) *Inst C E* * v 92-**88,** do. *The Eng* Feb 10-**88**

HOWE truss, timber, Willamette river, Albany, Or. *Eng* * Jan 6-**88**; timber structures, western Am. 180 and 250-ft. span, inset * Oct 7-**92**; determination of length of strut, D'Armit, cor. *E News* * Nov 16, 23, strut prob. Dec 14-**89**; Or. Pac. R., strain sheets, inset * Apr 26, 26; 50 and 68-ft. spans, Can. Pac. R. * May 24-**90**; R., Jameson *R & Eng* * Mar * May * June * Aug * Sep * Oct * Dec - **90** * Jan * Feb -**91**; Willamette

Bridges, HOWE
river, timber, Albany, Or. *R Gaz* * Apr 19-**89,** *Sc Am Sup* * Mar 17-**88,** *Eng*
HUDSON river, first design, Pope's flying lever, 1811 *R & Eng* * May -**88**; tunnel, ed. *E News* May 31-**90**
INDIA, bridging alluvial Punjaub rivers, ed. *Eng* Jan 31, notes, Feb 14, Mar 28-**90**; Chittravati, discuss., insets (full) *Inst C E* * v 103, 104 -**91.** See also BRIDGES, Chittravati — Hooghley river — Sukkur
IRON, wts. of, formulas, Beatty *Lehigh Eng J* June -**88**
JERSEY City, Harsumn's Cove transfer, Benset, insets *Am C E* * v 19 -**88**
KANAWHA river *E Rec* * Aug 17, 31 * Sep 14, 28 * Oct 5, 19, 26 -**89**
KENNEWICK, No. Pac. R. *R Gaz* * Nov 8-**89**
KENTUCKY river, or Tyrone cantilever, inset *E News* * Apr 5-**90**; Irvine, Ky., erecting * May 26-**92**
KENTUCKY & Indiana, Louisville *Eng* * Jan 27-**88**; Moulton, abs. *Inst C E* v 92 -**88,** *Am C E* Sep -**87**
KINGPOST truss, wrt. iron shoe for, Cin. N. Or. & Tex. R. *E News* * Apr 6-**89**
KINZUA viaduct, J. Clarke *Am M E* * v 11-**90**; 1882, T. Clarke *E News* July 5, n, Aug 30-**90**
LAGAN, Belfast *The Eng* * Aug 22, 29, 29-**90**
LANSDOWNE, at Sukkur, Indus river. See BRIDGES, Sukkur
LOA viaduct, Antofagasta R., Bolivia 336 ft., highest in world *E News* * May 18-**89,** *R & Eng* * June -**89,** *Sc Am Sup* * Mar 15-**90,** *The Eng* * Apr 19, 19, inset * 26-**89**
LONDON, England, Blackfriars, Thames river, Lond. Chat. & Dover R., Cruttwell, discuss., inset *Inst C E* * v 101 -**90,** *The Eng* Mar 21-**90**
THAMES river, proposed *E Rec* * Nov 19-**92,** do. Ratcliffe to Rotherhithe, and ed. *The Eng* * Oct 28, 28-**92**
TOWER. See BRIDGES, Tower, London
LONG span, discussion of, Lindenthal *E News* * Mar 3, 10, 24; very long span, proposed design, Warren * June 30-**88**; and North river, N. Y., Lindenthal, Nov 9, 16, 23-**89**; table *R Gaz* May 2-**90**
LYONS, Rhone river, Nansouty, abs. *Inst C E* v 106 -**91,** * *Genie Civil* v 19 -**91**; great, Fournere & Croix, Rousse *Sc Am Sup* * Oct 24-**91**

Bridges, MALLECO viaduct, Chili, Mamy, abs., inset *Inst C E* * v 104-**91** *Genie Civil* * v 18 -**91**
MANARVATER timber viaduct, New Zealand *E Rec* * Jan 4-**90**
MANHATTAN, Harlem river, N. Y. *Eng* * May 4-**88,** *E News* * Feb 4, Sep 8-**88.** See also BRIDGES, Wash.
MARBLE Creek viaduct *E Rec* * Apr 18-**91**
MARENT Gulch high viaduct, No. Pac. R. *R Gaz* * Apr 26-**89**
MARGHERITA, Rome *R & Eng* * June -**92,** *Industries;* Turin, Po river, abs. *Inst C E* v 92 -**88,** *Giornale Civ* -**87**
MASONRY, with semi-free joints, Cunningham *Eng* * May 6, *Sc Am Sup* * June 25-**92,** *An Ponts*
MATTABESSETT river, E. Berlin, Ct., inset *E News* * Apr 2-**92**
MAUCH Chunk suspension, Hildebrand *E News* * Feb 25, Mar 10-**88**
MEMPHIS R., Miss. river, Tenn. *E News* * May 12, inset * June 16, inset * Sep 15-**92**; erection *E Rec* June 20 * July 25 * Oct 17-31 * Nov 7-**91** * May 14-**92**; and ed. *R Gaz* * Feb 21 -**90,** June 26-**91** * May 13-**92**; *The Eng* Aug 3-**88**
MICHIGAN Cen. standard, with 3 inside guard rails *R Gaz* * Nov 1-**89**
MISSOURI Pacific, inset *E News* Feb 14-**91**
MOLDAU viaduct, at Cervena *E News* * Apr 19-**90**; Huss, abs., *Inst C E* v 98 -**89** * *Woch ost Ing* -**89**
MONTREAL, proposed *E News* May 31-**90**
MORAND, Rhone river, Lyons *The Eng* * Oct 16, 23, 30-**91**
NEEDLES, cantilever, Col. river, Cal., Atlan. & Pac. R., inset *R Gaz* * Apr 25-**90**
NEWARK Dyke, Grt. Northern R. *The Eng* * Mar 7, 21-**90**
NEW Brunswick, N.J., Albany st. masonry arch *E News* * Apr 16-**92**
NEW London, Ct., Thames river. See BRIDGES, Thames river
NEW Orleans, Miss. river, projects *R Gaz* * May 16 * July 11-**90**
NEWPORT viaduct, Isle of Wight, inset *Eng* * Jan 25-**89**
NEW York Cen. double track with solid plate floor *R Gaz* * May 17-**89**
NEW York and N. J., Clark report, inset *R Gaz* * Sep 23 *Sc Am Sup* Oct 22-**92.** See also BRIDGES, Harlem, Manhattan, North river, railroad, Washington, etc.
NEW York, Prov. & Boston ballast floors *E News* * Mar 1-**90**
NEW York Rapid Transit R. viaduct, proposed *E News* * Oct 31-**91**

Bridges, NEW York Terminal R., Hudson river, proposed *E Rec* * Jan 14-**88**

NIAGARA suspen., towers reconstruction, Buck, *Am C E* v 17 -**87,** abs. *Inst C E* v 93 -**88**

NORFOLK & Carolina transfer, inset *E News* * Jan 30-**92**

NORFOLK & Western standard plans *E News* * June 23, 28-**88**

NORTH river suspen., N. Y., proposed, Macqueen *Cosmop* Aug -**92**; Lindenthal *Eng* * May 9-**90**; and world's great *E News* * Jan 14, 14, discuss. of long span bridges, Lindenthal * 28, 28, Feb 4-**88**; July 20-**89**; Lind. reply *E Rec* July 20-**89**; *Sc Am Sup* * Nov 7-**91**, *R Rev;* Lindenthal's project, criticism, Ende *The Eng* * May 17, Lind. Aug 30-**89**

OAKLEY skew, Cin. & Rich. R., design and erection Crowell, insets *Am C E* * v 23 -**90**

OHIO, Cin. & Covington Elevated R., Burr, *Am C E* v 23-**90,** abs. *Inst C E* v 103 -**91**

OHIO Connecting R., Pitts, Pa., floating 523-ft spans into place, inset *E News* * Sep 20, false works * 27-**90,** do. (full) *E Rec* * Sep 13, erection * Dec 13-27-**90** * Jan 3-**91,** Strobel, abs. *Inst C E* v 103 -**91**; inset *R Gaz* * June 20, Aug 22, inset * Sep 12-**90**

OHIO river, completion of, *E News* Jan 12-**89**

OMAHA, erection *E Rec* * Mar 9, 16-**89**; suit *R Gaz* July 31-**91**

ORISKANY, N.Y., Cen. & Hud. R. R., inset *E News* * Dec 7-**89**

OSCHUTZ viaduct *R & Eng* * May -**88**

PADERNO viaduct, Adda river, Sacheri, abs. *Inst C E* v 98 -**89** * *L'Ingeg Civile* -**89,** *R Gaz* * Sep 14-**88**

PALATINE, Tiber river, Rome *R & Eng* * Mar -**92**

PARALLEL-chord, tables for finding stresses in, Hitchcock, inset *E News* May 23-**91**

PASSENGER ferry, N.Y. L. Erie & W. R. *E News* * Apr 6, cor. 20-**89**

PATIALA-Bhatinda R., iron-work *The Eng* Nov 16-**88**

PECOS river, Southern Pac. R., Tex. *E News* * Feb 6-**92**

PENCOYD shop *E Rec* * July 27 * Aug 3-**89**

PENN. R. frt. car transfer, Jersey City, inset *E News* * Jan 18, 18 -**90**; draw-bridge lock *R Gaz* * July 27-**88**

PHILADELPHIA, Market st. cantilever, Amweg *E News* Apr 7-**88**

PIERS, Red river concrete, Purdon *E News* * June 2-**88**; French masonry and detail * Sep 5-**91**; Stettin, Ger., masonry removal * July 14; screw piles for * Aug 4-**92**; moments, graph.

Bridges, PIERS
method of obtaining, Lindenberger *F Inst* * Nov -**89**; and river crossings, Otagawa *R & Eng* * Nov * Dec -**88,** Jan -**89**; repairing under water, Rossignol * Sep -**90,** *An Ponts*
PILE and trestle, Robinson *E News* Apr 7-**88.** See also BRIDGES, railroad; PILING; TRESTLES
PINS, fibre strain in, J. Johnson *E News* * Jan 28, Du Bois, cor. Mar 10, strains in, Fowler, cor. * 24; and eye-bars, proportions, Stowell, Mar 31-**88**
PO river, at Casalmaggiore, Parma-Brescia R., erection *E Rec* * May 5-26-**88,** abs. *Inst C E* v 95 -**89,** *L'Ingeg Civil* -**88**
POLLET swing. See BRIDGES, draw-bridges
PONTOON, Indian boat, Fenner *R & Eng* * Sep -**88**
PONY lattice, N.Y., West Shore & B. R. *R Gaz* * Sep 21-**88**
PORTABLE, Brochocki's *Eng* * Apr 5; Paris exhib. * Aug 2-**89**; *E News* May 26 * Sep 1-**92**; French iron, Talansier *E Rec* * Jan 12-**89** * *Genie Civil;* metallic, for quick erection, Pichault, abs. *Inst C E* v 91 -**88,** *Assoc Ings Liege* -**87**
PORTAL bracing, anal. of stresses, Cain *E News* July 13-**89**
PORTSMOUTH & Gosport floating, Harris *Eng* * Oct 7, *E Rec* Oct 15, *Sc Am Sup* * Nov 19, *The Eng* * Sep 23-**92,** *Inst M E*
POUGHKEEPSIE, cantilever, Hudson river, construction, O'Rourke, insets (full) *Am C E* * v 18 -**88,** inset *E & Min* Feb 2-**89,** *E News* Jan 7-**88** * Feb 16-**89,** abs. *Inst C E* v 96 -**89,** T. Clarke *Sc Am Sup* * May 19-**88,** *The Eng* Sep 21-**88**
PROVIDENCE, R.I., Point st., guard gates, Bullock, insets *Am C E* * v 20-**89,** *E Rec* * Nov 28-**91**
QUERETARO aqueduct, Mexico *E News* * June 2-**88**
QUINDARO, caissons and cribs, inset *E News* * Apr 4-**91**
RADIAL truss, F. Smith, cor. *E News* * Apr 11-**91**
RAILROAD, wts. of, Du Bois, inset, new form of strut, Strobel *Am C E* * v 18-**88**; Am., Cooper, discuss., insets (very full) * v 21, 21 -**89**; R. bed for bridge structures, Woolson *Am M E* * v 9 -**88**; bridging canons lengthwise, Hinckley, inset * v 26-**92**; Burge, Walton, Cruthwell *Eng* Mar 7-**90**; Am. viaducts, Greiner * Aug 14-**91**; Glenury viaduct renewing in Scot., Caled. R., inset * Sep 2, Earn viaduct * 16-**92**; Am., Cooper, (full) *E & Min* * Oct 5-26 * Nov 2, 9, 30-**89,** do. *E News* * July 6-**89**; Am., origin and evolution, Greiner * June 6-**91**; use of steel for, symposium, Mar 26, Apr 2, Aug 25-**92**; wrt.

Bridges, RAILROAD
iron floor beam, test, Boller *E Rec* * Dec 10-**87**; new form of strut, Strobel, abs. *Inst C E* v 95-**89**; Dufferin, Hawkesbury, discuss., insets (full) * v 101 -**90**; Am., origin and evolution, Greiner *R Gaz* * June 5-**91**; recent construction of, Ritchie *Sc Am Sup* Jan 17-**91**, *J Assoc Eng Socs*; spacing cross-girders in, MacKensie *The Eng* * Mar 6-**91**; Moenchenstein failure, Switz., Ende * Feb 19-**92**. See also under BRIDGES, Howe truss, and names of places and railroads, Forth—Loa—London, Blackfriars—Oakley, etc.; PILING; TRESTLES
DESIGNING, disputed points in, Waddell, discuss., insets (very full) *Am C E* * v 26 -**92**, *E News* Dec 12, 26-**91**, *E Rec* Dec 12, 26-**91**, Jan 9-**92**, *R Gaz* Oct 14, 28, Nov 4, 25 -**92**
GUARDS, inside and outside, Dailey *E News* * Jan 28, 28-**88**; rerailing, Buf. Roch. & Pitts. * Sep 13; guard rails, McNicol, cor., ed. * Oct 4, 4-**90**; St. R., Holland * Mar 7; Cleveland rerailing guard * Apr 11-**91**; Dutch St. R., Post *R & Eng* * Apr; the Tilden * Sep -**91**; Sav. Fla. & W. standard *R Gaz* * Jan 17; and rerailer, Plant system * 31-**90**; location of guard rail * Feb 6-**91**
LEGISLATION *E Rec* Jan 16, 23-**92**
LOAD diag. for stresses in asimont *E News* * Mar 10-**88**; panel concentrations due to engine loads, Szlapka, cor. Dec 6-**90**
RERAILER, Locke's protector *E News* * Dec 27-**90**; Cleveland rerailing guard * Apr 11-**91**; Post's *R Gaz* * Mar 13 -**91**. See also BRIDGES, railroad, guards
STRAINS, produced by loaded cars of 90,000 lbs. capacity, Blakely cor. and ed. *E News* May 10-**90**. See also BRIDGES, strains and stresses
TIMBER structures, western Am. *Eng* * Sep 23, Howe truss 180 and 250-ft. span, inset * Oct 7-**92**
RAO Shri Pragmalji, Mandvi, Kutch, Sykes *Inst C E* v 103-**91**
RED river concrete piers, Purdon *E News* * June 2-**88**
RED Rock cantilever, Col. river, At. & Pac. R., foundations *E News* * Sep 27; Waddell, inset detail sheet * Oct 4, 4, correction, 11-**90**; Rowe *E Rec* Dec 19, 26-**91**, erection * May 7 * July 2-**92**, *Am C E*; abs. *Inst C E* v 103 -**91**
RIPARIA, Snake river, Wash. T. *Eng* * Nov 6, *Sc Am Sup* * Dec 19-**91**

Bridges, RIVERMONT, Lynchburg, Va. *E News* * Feb 21-**91**
ROCHESTER, N.Y., Driving Park ave., Genesee river *E Rec* * July 18 * Aug 1, *R Gaz* * July 17-**91**
ROCKFORD, Ill., State st. plate girder highway, inset *E News* * Feb 27-**92**
ROPE and military applics., Gisclard *Sc Am Sup* * Oct 17-**91,** *Genie Civil*
RULO, report, Morison, bk. review *R & Eng* Feb -**91**
ST. Guistina viaduct, So. Tyrol, inset *E News* * Feb 1, 1-**90**
ST. JOHN cantilever *E Rec* * Mar 16, 30-**89**
ST. LAWRENCE river, Lachine, Can. Pac R., inset *Eng* * Apr 13 -**88**
ST. Louis, Mo., Merchant's, Miss. river, inset *Eng* * May 15, inset * June 5, 5, inset * 12-**91,** inset *E News* * Dec 21, 21 -**89**; Grand ave., inset * July 18-**91**; Maline Creek * Feb 20 -**92**; Grand ave (suspen.) *E Rec* * June 6, 20, 27 * July 4 * Aug 8-29 * Oct 3, 10-**91**
ST. Mary's Falls, Sault Ste. Marie, wind strains on, diags. *E News* * May 25-**89**; Massy * Oct 18-**90**; canal and dam *E Rec* * Mar 22-**90**
ST. Paul, Minn., Miss. river high br. *E Rec* * Feb 16, 23, Mar 2 * Apr 6 * May 11 * July 20, erection * Dec 21, 28; Col. st. skew arch * Nov 23-**89**; Wabasha st., erection * Dec 26-**91** * Jan 16-**92**
ST. Peters, Dadore river *E Rec* Aug 10-**89**
SIBLEY, Missouri river, Chic. S. F. & Cal. R., Chanute, discuss., insets (full), construction, Wallace, superstructure, Breithaupt *Am C E* * v 21, 21-**89,** *Eng* July 5, 5-**89,** *E News* * Feb 18-**88,** abs. *Inst C E* v 99 -**90,** (dates) n *R Gaz* Feb 17-**88**
SIEE Ho, China R. *The Eng* Feb 3-**88**
SIOUX City, Monson report, pph. *R & Eng* * May -**91,** *R Gaz* Oct 3-**90**
SKEW portals *E News* Apr 27, Leschorn, cor. * May 18-**89**
SKIPTON & Ilkley, England *The Eng* June 15, 15-**88**
SOULEUVRE viaduct, France, Vire, St. Lo. & Caen R., piers *E News* * June 28-**90,** *E Rec* * Jan 10. 17-**91,** *Genie Civil, R & Eng* * Mar, *Sc Am Sup* * Apr 5, *The Eng* * Jan 24-**90**
SMITHVILLE, Mo., Chic. Kan. C. & Tex. R., inset *E News* * Jan 24-**91**
STAGING for girders bridges *The Eng* June 1-**88**
STARRUCCA viaduct, N.Y. L. Erie & W. R. *E News* * Sep 1-**88**

Bridges, STEEL compression members, strength, expts., Dagron *R Gaz* Jan 6-**88,** *Am C E* -**87**

STEUBENVILLE, P. C. & St. L. R., temporary support, renewing pier *E News* * July 12-**90**

STOCKTON-on-Tees, Victoria br., Neate *E News* * Sep 8-**92,** *Inst C E*

STONE. See ARCHES; BRIDGES, arched and names

STRAINS and stresses, Booth *Am C E* v 20 -**89**; greatest truss stress and position of load, etc., Eddy, inset (very full) * v 22 -**90**; slide moment diag. for computing, Greiner *E News* Apr 14; web stresses with curved chords, Lindenberger, cor. * 21 -**88**; safe stresses in, Ottewell, diag. * Feb 23; allowable strains in old, Fowler, cor. Apr 6; strains cal. by graph. method, Baldwin, diag. * Sep 28 * Oct 12-**89**; device for cal. strains, Howe, Jan 11; mechan. comput. of stresses, Fletcher * Mar 1, May 10, do. Webb, cor. * Apr 12; strains produced by loaded cars of 90,000 lbs. capacity, Blakely, cor. and ed. May 10; method of cal. strains in Whipple truss, W. Baldwin (math.) * Aug 30-**90**; computing strains, German practice, Waddell Dec 12-**91** * Feb 27-**92**; secondary stresses in framed structures, Hiroi *R & Eng* * Oct -**88**

STREET'S Run viaduct, Pitts. Vir. & Charleston R. *E Rec* * Mar 26-**92**

SUBAQUEOUS viaduct *E News* * Feb 28-**91**

SUKKUR cantilever, Indus river, Parsey, inset *Eng* * Mar 9, 9-**88,** inset * Jan 4-**89**; erection *E Rec* * Apr 9-23-**92**; the Lansdowne, Robertson, insets *Inst C E* * v 103-**91,** do. *The Eng* * Jan 9-**91**

SUSPENSION, and flume for lumber transport, Cal. *E News* * Apr 11-**91**; proposed new system, Steiner, cor. * Mar 12-**92.** See also under Bridges, names.

SUSQUEHANNA river, Phil., Harrisb. & Pitts. R. *R Gaz* * Feb 12 -**91**

SWISS No. Eastern standard plate girder *E News* * Mar 26-**92,**

TARANTE, Italy, n *Sc Am Sup* * Jan 14-**88**

TAVISTOCK & Shillamill viaducts, Plymouth & S. W. Junction R., England *The Eng* * June 6-**90**

TAY viaduct, Dundee, Barlow *Eng* May 18-**88,** discuss., insets *Inst C E* * v 94 -**88,** construction, Inglis *R Gaz* June 29-**88**

TESTING, Nansouty, Cuenot, abs. *Inst C E* v 108 -**92,** *Genie Civil* * v 19 -**91,** *An Ponts* July -**91**

Bridges, THAMES river, New London, Ct., N. Y. Prov. & Boston R., inset *Eng* * Apr 10 * May 8, 15-**91**; *E News* May 19-**88**; *E Rec* * Oct 11, 18-**90**; *R & Eng* * June -**88**, Nov -**89**, report, Nov -**90**; draw-br. pivot pier *R Gaz* * Nov 7-**90**; lower single span, opening, proposed *The Eng* * Mar 18-**92**. See also BRIDGES, draw-bridges

TIDE-water Pipe Co. suspen., Mauch Chunk, Pa. *E News* * Feb 25-**88**

TIMBER rolling-br., in Drowtheim, Cauer, abs. *Inst C E* v 92 -**88**, *Zeit Bauwesen* -**87**

TORKHAM, India, launching of, Ollenbach *The Eng* Jan 13-**88**, *Ind Engr*

TOWER, London, inset *Eng* * Sep 23-**92**; *E News* * July 6-**89**; *E Rec* May 21-**92**, *R & Eng* * Oct -**90** * Oct -**92**, * *Industries; The Eng* * Aug 16, 30, 30, Sep 6, 6 * Oct 18, 18 * Nov 8, 8, 15 * Dec 20, 20-**89** * Apr 17-**91**

TRANSANDINE, inset *Eng* * Dec 2-**92**

TRANSFER, Harsimn's Cove, Jersey City, Bensel, discuss., insets *Am C E* * v 19 -**88**

TRESTLES. See TRESTLES.

TRUSSES, formulas for wt. of, Du Bois *Am C E* * v 18-**88**; abs. do. *Inst C E* v 96-**89**; failures in 1889 and for 11 years, ed. *E News* Apr 19, 19; arch, Gilman, Aug 16-**90**; truss deflection, J. Johnson *R Gaz* Aug 1-**90**

TURIN, Po river, Margherita, abs. *Inst C E* v 92 -**88**, *Giornale Civ* -**87**

TWO Medicine, Great No. R., St. Paul, Minn. & Manitoba R *E News* * Mar 19-**92**

TWYFORD viaduct, Didcot, Newbury & Southampton R. *The Eng* * Dec 18, 25-**91**

VAN Buren, Ark. river, construction, Purdon, discuss., insets (full) *Am C E* * v 20 -**89**, piers erection, do *E Rec* * Jan 11-**90**

VANDEVANDA, Penn. R. *E News* * Jan 12-**89**

VERRUGAS viaduct, Oroya R., Peru, inset *Eng* * Apr 17; Olcott *E & Min* * Jan 24-**91**; *E News* * July 27-**89** * May 9-**91**

VIAUR, Du., viaduct Carmaux & Rodez R., proposed, inset *E News* * Nov 30, 30 *R & Eng* * Nov, *Genie Civil; The Eng* * Dec 27-**89**

VICTORIA, Stockton-on-Tees, Neate, inset *Inst C E* * v 109 -**92**; Kilmarnock *The Eng* Aug 30-**89**

VIENNA. Stephanie, Danube canal, abs. *Inst C E* * v 92 -**88**, *All Bauz* -**87**

Bridges, WASHINGTON, Harlem river, 181st st., N. Y. city, W. Hutton (bk.) *E & Min* * Sep 27-**90**; designs, inset *E News* * Dec 27-**90**; (Manhattan bridge) Hutton, bk. n *E Rec* Jan 31-**91**

WEEHAWKEN viaduct and pass. elevators, T. Brown, Blakeley, insets *Am C E* * v 27 -**92**, inset *R Gaz* * Jan 22-**92**

WEIGHTS of, DuBois, inset *Am C E* * v 18-**88**; formulas, Mosscrop *E News* Mar 17-**88**

WHARFE river, Yorkshire *The Eng* May 25-**88**

WHITE'S plate girder, Del. Lack. & W. *R & Eng* * July -**91**

WILLAMETTE river Howe truss timber, Albany, Or., Or. R. & Nav. Co. *R Gaz* * Apr 19-**89**, *Sc Am Sup* * Mar 17-**88**, *Eng*

WINNER, Kansas City, Mo., details, inset *E News* * Mar 15, inset * July 19, 19-**90**

Bridging canons lengthwise, Hinckley, insets *Am C E* * v 26 -**92**

Bright, Charles T. (full) *El Rev Lond* May 11, *Inst C E* v 93 -**88**, por. *Sc Am Sup* * July 7, *The Eng* May 11-**88**

Briquette-making machine, Paris exhib. *Eng* * May 24-**89**

British Assoc. pro., elec. papers, Lodge *El Eng* Nov -**88**, *Electric Lond;* Bramwell addr. *El Rev Lond* Sep 7, Preece, Fitzgerald (full) 14-28, Oct 5-19-**88**, (full) Sep 20, Anderson addr. * 27 * Oct 4, 11 * Nov 8-**89**, Abel addr. (full) Sep 5 * 12, 19, 26 * Oct 3, 10 * 24, 31-**90**, Huggins addr. Aug 21, 28 * Sep 4, 11, Oct 30, Dec 11, 25-**91**, (full) * Aug 12-26 * Sep 2, 23 * Oct 7-**92**; Lodge, Pres. addr. *El Wld* Oct 3-**91**

Eng Sep 14-28, Oct 5-26, Nov 2-**88**, official local guide, Newcastle, bk. review Sep 6, ed. 13, 20, 27, Oct 4-25-**89**, Aug 22, Abel, Pres. addr. Sep 5-26, Oct 3-17-**90**, Roberts-Austen, Pres. addr. Aug 21, 28, Sep 4-25-**91**, Aug 12-26, Sep 2-16-**92**

Sc Am Sup Dec 21-**89** * Oct 11-25, physics at, Nov 29-**90**; *The Eng* Preece addr. Sep 7, Bramwell addr. 7-**88**, Sep 13, 20 -**89**, Leeds, Abel addr. Sep 5 * 12, Noble addr. 19-**90**, Aug 28-**91**, Unwin, Pres. addr. Aug 5-19-**92**

FEDERATION, Am. view, Carnegie *E Mag* Nov -**91**; mint report, 1890 *E & Min* June 6-**91**

NAVY, naval engineer officers, pay, etc., cor. *The Eng* Aug 22-**90**; navy (list) July 1, 8-**92**. See also NAVIES, Great Britain; ENGLAND; GREAT Britain

Britton, Hiram M. *R & Eng* Sep -**89**

Bronze, aluminum bronzes, diag. *E News* * Feb 8-**90**; monumental uses of, Gardner *Sc Am Sup* * Mar 24-**88**, *Soc Arts Lond;* Stone's pat. *The Eng* * Apr 24-**91**
Brooklyn, navy yard *Eng* Oct 17-**90**. See also BRIDGES — RAILROADS, Brooklyn, etc.
Brooks, David, por. *El Wld* * June 6, *F Inst* July -**91**
Brown, C. E. L., por. *El Wld* * Oct 17-**91**
Brown, John *Inst C E* v 95 -**89**
Brown, Samuel *Inst C E* v 109 -**92**
Brown, Thomas *Inst C E* v 92 -**88**
Brown, William A. *Inst C E* v 95-**89**
Brush, Charles F., por. *El Rev* * Aug 2, *Harpers W* July 26-**90**
Buarque, Antonio L. *Inst C E* v 100 -**90**
Buchholz, John A. A. *Inst C E* v 101 -**90**
Buddicom, William B. *Inst C E* v 91 -**88**
Buell, Madison, por. *El Eng* * Aug 19-**91**
Buenos Ayres, gas supply, Stevenson *Inst C E* v 103 -**91**
Buffalo, N. Y., map *Eng* * Nov 30-**88**, *El Rev* * Feb 20-**92**
Buildings and building, notes *E Mag* Oct -**91**. See also ARCHITECTURAL eng; ELECTRIC light stations; EXHIBITIONS; FOUNDATIONS; MILL construction; RAILROADS, buildings; RAILROADS, electric power stations; ROOFS, etc.
AGRICULTURE, World's exhib., Chic. *Eng* * Apr 29, * May 6-**92**
ALLEGHENY County Courthouse *E Rec* * Nov 10-**88**
ANCHORING of, Goetz *Sc Am Sup* * Dec 21-**89**
ARCADE, Cleveland *E Rec* * Mar 21, 28 * Apr 4-**91**
ARMORY, O. N. G., Cincin. O. *E Rec* * Dec 7, 21-**89**; 12th reg't, N. Y. * Jan 7-**88**
ASSOCIATIONS *Sc Am Sup* Dec 28-**89**
AUDITORIUM, Chicago *Eng* * Apr 3, 24-**91**, *E Rec* * Apr 12, construction * Nov 22, 29-**90**, * Feb 21, * Mar 7-**91**; *Locom* May -**90**
BATHS, European public *E Rec* * Apr 18, special bath-room * Oct 3-**91**
BEAM anchoring, Goetz-Mitchell sys., com. rep. *F Inst* * Nov -**91**
BOILER shop, Pitts. Locom. works *R Gaz* * Feb 7-**90**
BOSTON Chamber of Commerce *E Rec* * May 7, 28, * June 4; building law, Aug 6-**92**
BRIGHTON beach hotel, Coney Is., moving *E News* Apr 7-**88**, *R Gaz* * Apr 6-**88**

Buildings, CHICAGO, and foundations, Sooy Smith, and ed. (full) *E News* Oct 13-**92**; fire-proof construc. *E Rec* * Feb 16-**89**; tall, construction on compressible soil, Jenney * Nov 14; the McVickers * June 13; Rand & McNally, construction * Dec 12 -**91**, * Jan 9, 30 * Feb 13-**92**. See also BUILDINGS, Auditorium, etc.

CHURCH, Buffalo, large wooden dome *E News* * June 28-**90**; roof truss, St. Paul *E Rec* * Oct 27-**88**; spire framing and anchoring * Jan 12-**89**; steeple, Asservent church * Dec 20 -**90**

CITY Hall, Kansas C., Mo. *E Rec* * Apr 2, 16-**92**; the city hall in Am., Ferree, insets *E Mag* * Nov -**92**

CLEANING, outside *E Rec* Feb 20-**90**

CLUB house, Down Town Assoc., N. Y., inset *E Rec* * Dec 10 -**87**; Freundshaft, N.Y. * Dec 15-**88**

COLUMBIAN exhib., Freitag *E Mag* * Nov -**91**; foundations and floors, Gottlieb *J Assoc E Socs* Dec -**91**. See also BUILDINGS, U. S. Gov't and under names; EXHIBITIONS, U. S. Columbian

COLUMNS, strength, formulas, Johnson *E News* Dec 22-**88**. See also COLUMNS

CONSTRUCTION, (safe) and slow burning, Woodbury *Eng* Apr 10 -**91**; notes, bk. review, May 6-**92**; fall of Park Place, Atkinson *E Mag* * Nov -**91**; fire-proof interior, Carrere * Oct -**92**; anchoring beams, Goetz-Mitchell system *E News* Nov 21-**91**; errors in, D'Oevich *E Rec* May 12-**88**; fire-proof, Chic. * Feb 16-**89**. See also BUILDINGS, high

CONTRACT, standard, com. rep. *E Rec* Sep 15-**88**; contractor's eng. and plant, files -**88**-**92**

COURT house, Allegheny Co. *E Rec.* * Nov 10-**88**; Custom house, National, Bell, Dec 3-**87**

DOME, Buffalo church, large wooden *E News* * June 28-**90**

DREXEL office, Phil. *Eng* * Nov 15-**89**, *E Rec* * May 4-25-**89**

EARTHQUAKE countries, building in, Milne *E News* Jan 10-**91**, *Inst C E* v 100 -**90**

EDGEMOOR Bridge works shops *E Rec* * Apr 19, 26 * May 3-**90**

EFFLORESCENCE and impervious mortar, Baker *E News* Apr 7 -**88**

ELECTRIC, World's Columbian exhib. *Eng* * Dec 16 * 30-**92**. See also EXHIBITIONS, U.S.

FERRY house, Barclay st., N.Y. *E Rec* * Nov 24-**88**

Buildings, FIRE-proof, slow burning construction, Woodbury *Eng* Apr 10-**91**; interior, Carrere *E Mag* * Oct -**92**; construction, floors *E News* * Nov 9-**89**, do. Haesecke * Apr 12, do. cost, etc. * 19; Schneider floor * Feb 8; plaster boards, Bush, cor. May 10-**90**; floor arches, St. Louis tests *E Rec* * May 7; Smith & Randolph, N. Y., floors, Oct 29, Nov 5 * 12 -**92**. See also FIRE protection

FLOORS. See BUILDINGS, fire-proof floors

FOUNDATIONS, Columbia Elevator, Prov., new, Hawks *E News* * Feb 25-**88**; Chicago, Sooy Smith, and ed. (full) Oct 13-**92**; heavy *E Rec* Jan 31-**91**, *Lond Architect;* World's Columbian exhib., Gottlieb *J Assoc E Socs* Dec -**91**. See also FOUNDATIONS

HIGH, *Am C E* wind bracing in, Quimby, discuss. * v 27 -**92**

E Mag tall office, of N. Y., J. Robinson, insets * May -**91**, dangers from, Goetz * Mar, past and future, Adler, Sep, light in, do. insets * Nov -**92**

E News in cities, ed. Jan 19-**89**; steel skeleton type of, Purdy * Dec 5, 12 * 26-**91**, * Jan 2, Milliken, cor. * 9, heavy timbering, new methods * July 28-**92**

E Rec heavy, Gibson, Nov 3-**88**; Drexel office, Phil. * May 4-25, do. *Eng* * Nov 15-**89**; Chicago tall, construction on a compressible soil, Jenney, *E Rec* * Nov 14-**91**; tall, safe construction, W. Smith, Apr 9; wind bracing in, Quimby, Nov 19, Dec 31 etc. -**92**

R Gaz Chicago tall * Oct 30, details (full) Nov 27-**91**

HORTICULTURAL, World's Col. exhib. *Eng* * Oct 28 * Nov 11, 18, 25-**92**

HOSPITAL, Boston City *E Rec* * Jan 4-**90**; Children's, Berlin * Sep 8-**88**; Ogden, Utah * Feb 7-**91**; portable, or barracks, Nieden's *Sc Am Sup* * Jan 14-**88**

HOTEL, Park Central, Hartford, destruction of, *Locom* Mar-**89**; Ponce de Leon, Fla. *E News* * Mar 16-**89**

HOUSES, residences, insets *E Rec* * files **88-92**

IRON, skeletons for, Breithaupt *E Rec* * Mar 5-**92**; structures, strength in compression at high temps., Moller, abs. *Inst C E* v 92 -**88**, *Verhand Gewer* -**87**; mill, Seaver *R Gaz* July 15 -**92**. See also BUILDINGS, high

LAW, use, J. Robinson *E Mag* Aug, Sep, Henry, Nov -**91**; enforcement, T. Clark *Tech Q* Sep -**87**, Feb -**88**; National regulations, proposed *E Rec* Apr 25-**91**; Boston, Dec 20-**90**, Aug 6-**92**; Bridgeport, Aug 31-**89**; N. Y. Apr 30-**92**

Buildings, LIBRARY, Newark, N. J.. insets *E Rec* * Oct 26-**89**; Tilden Trust, N.Y., proposed, Bigelow *Scribner's* * Sep -**92**
MACHINERY Hall, Paris exhib. *E Rec* * Aug 24 * Sep 7, 21, 28 * Nov 2-**89**; World's Columb. exhib., details * Nov 19, 26 * Dec 24, 31, etc. -**92.** See also EXHIBITIONS, U. S. Columbian
MADISON Sq. Garden, N.Y. *E Rec* * Aug 30 * Sep 20, 27-**90,** * Jan 17, 24, 31, plumbing * Apr 11-**91**
MANUFACTURES, World's Columb. exhib., inset *E News* * Sep 1 -**92.** See also EXHIBITIONS, U. S. Columbian
MARKET Hall, La Plata, Ende *The Eng* * Nov 28-**90**
MASONIC Temple, Chic. *Eng* * Aug 7-**91**
MATERIALS, market, '89 *E & Min* Jan 4-**90**; Xylolith (wood-stone), new *E News* * July 28-**92**; normal working loads, com. rep., tables *E Rec* Dec 14-**89,** do. Austrian Assoc. of Engr's, abs. *Inst C E* v 97-**89,** *Woch Ost Ing* -**89.** See also BRICK; CEMENTS and mortars; COLUMNS; CONCRETE; MATERIALS; PLASTER; STONES; TIMBER; WOOD, etc.
MAUSOLEUM, or campo santo. N.Y., (full) *Sc Am Sup* * Jan 4-**90**
METROPOLITAN opera house, N. Y., construction *E Rec* * June 13; St. Paul, Minn. * July 11-**91**
MILL, construction details, Hutchinson, inset (full) *E News* * Nov 10-**92.** See also MILLS
MONMOUTH Park Assoc., N. J., grand stand *E News* * Jan 18, inset * Mar 29, 29-**90**
MOVING, Brighton beach hotel, Coney Is., N. Y. *Sc Am Arch edition* * May -**88,** *The Eng* Apr 27, 27-**88,** masonry, and raising *The Eng* * Dec 30-**92**
MUSEUM, and arrangement, Ferree *E Mag* * Nov -**91**
N. Y. Music Hall *E Rec* * July 4-**91**; N. Y. World (Pulitzer) *E Rec* * Nov 1, 8, 15-**90,** do. *Sc Am Sup* June 13-**91**; Western Elec. Co.'s *El Eng* * Apr -**89**
OLYMPIA, Nat. Agric. Hall, roof erection, Read *Eng* * Dec 28 -**88**
ORCHARD house *Sc Am Sup* * May 19-**88**
PALACE of Chapultepec, Mex., grand stairway *E News* * May 11-**89**
PARIS Post Office *Sc Am Sup* * Aug 25-**88**
PAVILION, Coney Is. *E Rec* * Nov 9-**89**
PHŒNIX girder shop, Pa., framing *E Rec* * Apr 7-**88**
PRISONS, French *E Rec* * Oct 6-**88**; Lack. Cty. * Nov 30-**89**

Buildings, PONCE de Leon hotel, Fla., concrete construction *E News* * Mar 16-**89**
PORTABLE, Ducker's *Eng* * Feb 3-**88**; hospital or barracks *Sc Am Sup* * Jan 14-**88**
PROTECTION, electric, against water overflows, Weil *F Inst* Oct -**88.** See also FIRE protection
REPAIRS and restoration, hints to workmen *E Rec* Nov 19-**92**
RIDING School, 75th st. N. Y., elevated ring *E Rec* * June 16-**88**
ROOF water removal, Porter *E Rec* May 4-**89,** *Tech Q* * Feb -**89.** See also ROOFS
ROOKERY, Chicago *E Rec* * Nov 3-**88**
ST. Augustine, Fla., concrete construction, Ponce de Leon, etc. *E News* * Mar 16-**89**
ST. Mark's, Venice, Scott *Sc Am Sup* Jan 7-**88**
SKYLIGHT, dome, No. West Life Ins., Mil. *E Rec* * July 6-**89**
SORBONNE, Paris *Sc Am Sup* * Sep 7-**89**
STEEL works, Homestead, Press shops *E News* * Nov 10-**92**
STONES, and decorative, of Egypt *E & Min* Feb 25-**88**; British, crushing strength, Beare (full) *E News* * Sep 22-**92,** do. inset *Inst C E* * v 107 -**92**; N.Y., report *Sc Am Sup* Dec 31-**92.** See also STONES and names of material, as GRANITE, etc.
STOREHOUSE construction, standard, Woodbury *E & Min* Apr 4, * Sep 26 *E News* * Oct 17 *E Rec* * Sep 19 *Sc Am Sup* * Oct 24-**91**
SUBURBAN summer communities, Wingate *E Mag* * Sep -**92**
THEATRES construction and arrangement, Hexamer *F Inst* July -**92**
TRANSPORTATION, World's Columb. exhib. *Eng* * Dec 2, 9-**92**; inset *E News* * Dec 29-**92.** See also EXHIBITIONS, U. S. Columbian
U. S. Gov't, World's Columb. exhib., Chic., ironwork for dome, McGuire, insets *Am C E* * v 26 -**92.** See also BUILDINGS, names; EXHIBITIONS, U. S. Columbian
WATER closet, London public *E Rec* * Mar 19-**92**
WORLD'S Columbian exhib., U. S. See BUILDINGS, names; EXHIBITIONS, U. S. Columbian
Bull's patent metal *Eng* July 26-**89,** *The Eng* May 25-**88**
Bullet probe, telephonic, Girdner *Sc Am Sup* * Mar 3-**88**
Bullmore, Frederick C. *Inst C E* v 92 -**88**
Bullock, Milan C., por. *E & Min* July 25-**91**
Burglar's kit *Sc Am Sup* * Oct 4-**90**

Burial, sanitary disposition of the dead, Harvey *F Inst* Nov -**89**; entombment, Mausoleum Co's system, com. rep. * Apr -**90**

Burnett, Arthur W. *Inst C E* v 103 -**91**

Burnham, N. F. (turbine inv.), por. *Sc Am Sup* * Mar 28-**91**

Burrell, Percy *Inst C E* v 103 -**91**

Butter, composition, Vieth *Sc Am Sup* Mar 14-**91**; extractor *The Eng* * June 28-**89**

Buttle bodies nature, Kick, abs. *Inst C E* v 100 -**90**, * *Tech Blatter* -**89**

Butts, Elijah P. *Am C E* v 26-**92**

Cable Railroads, friction or lost work of, Eckart *Am M E* -**92**; relative cost of operating by horse, cable and electricity, com. rep., tables *El Rev* Oct 29, *E News* Oct 27, *E Rec* Oct 29, *St R J* Nov-**92**; st., stats., cen. bull. *El Wld* May 9-**91**; tramways, Colam *Eng* Sep 12-**90**, ed. Nov 27-**91**; and electric, return of power in, Bryson *E & Min* * Dec 7-**89**; roller grip system of Rap. Tran. Cable Co. * May 31-**90**

E News electric and animal power, relative econ., cen. bull, report, May 23, Badger, Oct 24; life of grip-faces and cables. July 11; carrying across a draw-bridge, proposed method, Church's, Sep 19; elec. and horse, relative econ., Badger, Oct 24; motive power, prog., J. Robinson, Nov 7-**91**, do. com. report *E Rec* Feb 20, 27, Mar 5, 12, 19, Apr 16; elec. and horse, relative cost of op., report, Oct 29-**92**

Inst C E and electric, Kebby, abs. v 105 -**91**; prog. (life of ropes), Robinson, v 107-**92**, *J Assoc Eng Socs* Feb -**91**; variation of load on, table *Pwr* Nov -**91**; prog., Robinson *R Gaz* Nov 6-**91**; st., Austria, Ziffer, Sep 30 *Zeit Eng Arch* July 22; horse and elec., relative cost of op., report, Oct 28-**92**

St R J single track double * Feb; advantages of cable power; Holmes, Apr, Bergmann's grip * July; Walker, Oct, Nov, financial conditions, Henry, Nov -**88**; Volk grip * Dec -**89**; driving drum's wear of grooves * Mar; trains, Fairchild (full) * Sep -**90**; electric and, construction and op., Kebby (full), May; how to reduce op. expenses, Bowen, June; motive power prog., com. rep. (very full), Nov -**91**; and electric, relative advantages, Feb, cor. Mar, July, Aug, Nov, Dec -**92**; com. rep., Robinson *The Eng* Nov 6-20-**91**. See also RAILROADS, incline-mountain

Cable Railroads, BIRMINGHAM, England, st., ed. *Eng* Mar 30, *Sc Am* Nov 3, *The Eng* June 22,29, 29, Sep 28, 28-**88**
BROOKLYN bridge, N. Y., Leverich, insets *Am C E* * v 18 -**88,** inset *Eng* * Oct 5 * 26, Nov 9, 16, 30-**88,** abs. *Inst C E* v 95 -**89**; terminals, com. report and ed. *R Gaz* * Apr 27-**88,** (full) *St R J* * July, grip * Dec -**90**
CALIFORNIA, in, Van Vleck *Eng* * Jan 9-**91.** See also CABLE R., Oakland, San Diego
CHICAGO, No. & Western *St R J* * May -**90**
CLEVELAND City *St R J* * June -**91**
CROIX-Rousse, Lyons *The Eng* Dec 7-**88**
EDINBURGH No. Tramways *E News* * July 20-**89,** Colam (full) *St R J* * Jan -**91,** *The Eng* * Aug 8, 8-**90**
FRENCH *R & Eng* * Jan -**89,** *Genie Civil.* See also CABLE R., Havre
GREAT Britain, and electric, McCallum *St R J* Oct -**92**
HAVRE, Foris, abs. *Inst C E* v 106 -**91,** *Genie Civil* * v 19 -**91**
HECKERT system *St R J* * Aug -**88**
KANSAS City *E News* Dec 8-**88**; traction, effic. diag. * May 3 -**90**; *St R J* * Jan -**88** * Feb -**90**
LIGHT road construction, Van Vleck *Am M E* * v 11 -**91,** *E News* * Nov 22, roads * 29 *St R J* * Dec -**90**
LONDON, England, electric and *El Rev Lond* Sep 16-**92**
Los Angeles, Cal. *Eng* * Aug 28-**91**; cable viaduct *E News* * Jan 25-**90**; Nov 7-**91**; single-post viaduct, Hawgood, Temple st., Wood, inset *Inst C E* * v 107 -**92**; *Sc Am Sup* * Oct 10-**91**; *St R J* * Mar, Temple st. Co. * Sep -**90**
MELBOURNE, Australia *St R J* * Feb -**90**
MT. S. Salvatore, near Lugano, Switz., Strub, abs. *Inst C E* v 110 -**92,** * *Schweiz Baus* -**92**
MT. Vesuvius, Zanetti, n *St R J* * Mar -**91**
MULLER traction system *St R J* * Dec -**92**
NEW York city, Broadway, building, Iles, insets *E Mag* * Dec -**92**; 3d ave., track details, inset *E News* * Dec 13, pulleys and lifts * 20-**90,** Broadway, insets * Aug 22-**91,** do. *E Rec* * July 25 * Aug 15 * Nov 7, 14-**91** * Sep 3 * Oct 1, do. *R Gaz* * Sep 2-**92**; 3d ave. *St R J* * Nov -**90,** construction * June, Broadway work * Aug, 3d ave. construction * Sep -**91**
OAKLAND, Cal., novel *St R J* * Dec -**90**
OTIS elevating R., Catskill mts. incline, inset *E News* * Aug 18 * Sep 8, *R Gaz* * Aug 12, 26-**92**

Cable Railroads, PARIS, the Belleville *Sc Am Sup* * Sep 6-**90**, *Genie Civil*
PHILADELPHIA Traction Co., conduit, Wagner *F Inst* * Feb -**88**
ST. Louis, inclined, for frt. car transfer *R Gaz* May 20-**92**; plant *St R J* * June -**91**
SAN Diego, Cal., Van Vleck *St R J* * July -**91**
SWISS, Strub *R Gaz* July 8-**92**, *Schweiz Baus*
TERRY system *St R J* * May -**89**
VOGEL system, conduit and grip *E News* * Jan 31-**91**
WASHINGTON & Georgetown R. power station *St R J* * Dec -**91** * Sep -**92**
WHITE'S, R. T., conduit *E News* * June 20-**91**
Cacao (chocolate bean), Curtis *Sc Am Sup* Mar 15-**90**
Caffeine, action of (full) *Sc Am Sup* June 21-**90**. See LAPICQUE
Calculating machine, Felt's *Sc Am Sup* Oct 27-**88**. See also CENSUS tabulating, Hollerith machine
Calculation, mental, Bidder, Pole *Inst C E* v 103 -**91**, remarkable feat of, do. *E News* Sep 19-**91**; multiplication, quick method, Fuller, cor. Jan 30-**92**
Calendar, perpetual, McFarland's *Sc Am Sup* Apr 11-**91**; old style and new (reckoning) *Locom* Oct -**90**
Calorimeters, simple, Peabody *Am M E* v 10 -**89**; errors of different types, do., an universal, Barrus * v 11, 11-**90**; notes, Carpenter * v 12 -**91**; Barrus' universal *E News* * May 31-**90**; new, Peabody F *Inst* * Aug -**88**; for testing fuels on a small scale, Donkin *Inst C E* * v 102 -**90**, do. *The Eng* * Jan 9-**91**; Heisler throttling *Pwr* * Feb -**91**; steam, for locom. use, ed. *R Gaz* Jan 22-**92**; Peabody *Tech Q* Oct -**88**, errors, expts., do. Feb -**90**
Cameron, John *Inst C E* v 109 -**92**
Camp stove *E News* * Nov 1-**90**
Camphiers, Gerrit W. *Inst C E* v 109 -**92**
Cams cutting, new proc., Gabriel *Am M E* * v 13 -**92**, *Iron Age* * Dec 8-**92**
Canada, Sudbury ore-deposits, Ont., Peters *Am Min* v 18 -**90**; reciprocity with, Wiman *E Mag* Oct, Dec -**92**; province of Manitoba *E News* Jan 5; eng. works, Keefer, 26; and U. S., pop. growth, 1790 to 1880, Apr 27; water-works of, ed. and drag. * 27, 27, May 4-**89**; census, ed. Nov 14-**91**; notes, Nov

Canada
3-**92**; mineral resources, ed. *The Eng* Jan 2-**91**. See also MINES; QUEBEC; RAILROADS, Can. Pac., etc.

Canals, ship, in 1889, Peary *Am C E* v 21 -**89**, do. (full) *Sc Am Sup* Aug 31-**89**, Feb 1, 8-**90**; vs. railroads, ed. *Eng* Aug 24-**88**; inland waterways development, Marten, Aug 15, Congress, internat. * Aug 8-29, Sep 5; water transport. in different countries, Jeans, bk. review, Dec 19-**90**, European, ed. Nov 18-**92**; construction, mechan. appliances, E. Williams * Sep 25-**91**, do. *E News* * Oct 31, minimum width, ed. June 27-**91**; in 1889, Aug 3, 10-**89**; English system, Aug 16; Congress, Aug 30, Sep 6-**90**; inland nav., European *E Rec* Nov 22, 29-**90**, Internat. Congress on, consolidation of canal banks * Sep 3, 10, Oct 1; Haupt *F Inst* Nov -**92**; Congress, report, abs. *Inst C E* v 95 -**89**, * *An Ponts* v 15-**88**

The Eng inland, development, Aug 3-**88**; the canalization of rivers, Boulé * Jan 18 * Feb 15 * Mar 22 * Apr 26 * May 24, June 21; and inland nav., Wheeler, Feb 8, 22, Mar 8, Apr 5-**89**; and railroads, relative advantages for transport. Oct 3-**90**; and inland nav. in 1890, Jan 2-**91**, do. France, map * Oct 21; water supply of * Aug 26-**92**. See also IRRIGATION, Am. eng; RIVERS, Main, canalization, etc.

AMERICAN Isthmus interoceanic commun., Barroll, maps (full) *R & Eng* * Apr — * Aug -**90**

BALTIC & North Sea, floating elevator, inset *Eng* * Feb 20; *E News* * Aug 1, Oct 17-**91** * Mar 26-**92**; *R & Eng* * Apr -**91**, *Mittheil Seewesens*

BELGIUM, canal du centre, hydr. lift at La Louviere *Eng* * Oct 12-**88**; river and other works in Bel., France and Germany, Vernon-Harcourt, discuss., insets (full) *Inst C E* * v 96 -**89**

BIRMINGHAM & Liverpool ship, proposed *E News* Oct 25, *R Gaz* Oct 3, map *The Eng* * Sep 26-**90**

BOISE river, Idaho *E News* * Apr 26-**90**

BOATS haulage and Bovet's magnetic pulleys *El Rev Lond* * Oct 21-**92**; propulsion, a suggestion in, Vogt *Sc Am* Mar 16-**89**; traction by cable *Sc Am Sup* * Jan 26-**89**. See also CANALS, cable towing on

BRUGES maritime *The Eng* * June 17-**92**

CABLE towing in France *R & Eng* * Apr; Chatelier * Nov -**89**, Goodwin, cor. Feb -**90**; *Sc Am Sup* * Jan 26-**89**

CASCADES, locks *E Rec* * Oct 8, 15-**92**

Canals, CHICAGO drainage *E News* * June 2, 30-**92**
CORINTH ship, St Yves, Greece *E News* * Jan 17-**91,** abs. *Inst C E* v 96-**89** * *An Ponts* v 16-**88**; *R & Eng* Sep -**90**; *Sc Am Sup* July 14-**88**
DOLORES, Col., head gates and boom, inset *E News* * Jan 4-**90**
EMS-Jade, Kurs, abs. *Inst C E* v 92-**88,** *Deut Bauz* -**87**
FINLAND, roads and railroads, Strukel, abs. *Inst C E* v 99 -**90,** *Allgem Bauz* -**89**
FORTH & Clyde ship, Scot., proposed *Eng* Feb 14, Crawford, Aug 29-**90**; *E News* Dec 14-**89,** Apr 25-**91**
FRANCE, cost of motive power on, *E News* June 14-**90**; river and other works, Vernon-Harcourt, discuss., insets (full) *Inst C E* * v 96 -**89**; internal nav. in *R & Eng* Jan -**90.** See also CANALS, Havre
GANGES, lower, failure of Kali Nadi aqueduct, Thelnall, abs. *Inst C E* v 95 -**89,** construction, Good, inset * v 105 -**91**
GERMANY, Belgium, France, river and other works, Vernon-Harcourt, discuss., insets (full) *Inst C E* * v 96 -**89**
GREAT Britain, Soc. of Arts conference *R Gaz* July 27-**88**; inland nav., Clements *The Eng* Aug 15, 22-**90**
GREAT Western ship, England, proposed, map *Eng* * Oct 12-**88**
HAGUE, renewal of water in, Pichler, abs. *Inst C E* v 95 -**89,** *Woch Ost Ing* -**88**
HAVRE to Tancarville, Widmer, abs. *Inst C E* v 110 -**92,** *An Ponts* May -**92**; *Sc Am Sup* * Sep 15-**88,** *La Nature*
HUDSON river ship and great lakes, North *E News* May 5, *Forum* May -**92.** See also CANALS, Lakes
INDIA, ed. *Eng* Oct 14-**92**
JURAPA irrig., Finkle *E News* * May 17-**90**
KIOTO & Lake Biwa, Japan *Eng* * Jan 25-**89**
LAKES, Erie & Ohio river ship, proposed *E News* * Mar 21, do. *R Gaz* Apr 10-**91**; Great lakes & Atlantic seaboard enlarged waterway, Corthell *Eng* July 17, 24, do. *E News* Apr 18 * 25, do. (very full) *Sc Am Sup* July 4-**91,** *J Assoc E Socs;* Superior & Mich., proposed, maps *E News* * Mar 22-**90**
LIFTS, hydr., Prussman's *Eng* * Oct 14-**92**; lifts on, Harcourt *E News* Aug 4-**88**; hydr., Belgium *R & Eng* * Mar -**89,** *Genie Civil*
FONTINETTES, France, hydr. *E & Min* * Sep 29-**88,** * *Industries,* vertical, Hoppe system, Petri *E News* * May 9, 23 -**91,** *E Rec* * June 23 *R Gaz* * Sep 28, *Sc Am Sup* * Sep 29 -**88,** *The Eng* * Dec 21-**88** * Jan 11, 25 * Feb 15-**89**

Canals, Lifts, LA Louviere, Belgium, hydr. *Eng* * Oct 12, *The Eng* Dec 21, 21-**88** * Jan 25, 25-**89**

LIVERPOOL & Birm. See CANALS, Birmingham

LOCKS, accident, Sault Ste Marie *E & Min* * Aug 30-**90**; of 20 metres (65 ft.) lift, Fontaine's *E News* * Sep 19-**91**; Cascades *E Rec* * Oct 8, 15; gates, distrib. of beams in, Stoney *The Eng* * Apr 1; adjustable and weir, Hale, cor. * May 6-**92**

MANCHESTER ship, ed. *Eng* June 8, 15, 29, July 20, Sep 7, 21, Oct 5, ed. Dec 21, 28-**88,** Apr 25, Wins * Aug 29 * Dec 5-**90** * Jan 16 * Feb 13, 27 * Mar 13, 27 * Sep 11 * Oct 2, ed. Dec 4-**91**

E Mag Dunell * Nov, Dec -**91**; and Corinth *E News* June 30, July 28, Aug 4 * Sep 29-**88,** profile * Jan 11-**90**; *E Rec* * Sep 29 * Nov 17, Dec 8, 15-**88,** Feb 16 * June 8, 15, July 27 * Sep 7 * Oct 5, 26-**89**; mechan. appliances, Wins. insets *Inst M E* * July -**91**; Harrison *Locom* Dec -**89**; *R & Eng* * Oct -**90**; *R Gaz* Sep 14-**88,** Hansel, map * Aug 19-**92**; Wells *Sc Am Sup* Feb 16-**89,** map * Aug 16-**90**

The Eng Wells, Sep 21, and Barton aqueduct, Nov 2-**88**; * May 24-**89** * Jan 31, map * July 11 * Aug 22 * Oct 10, Nov 14-**90,** Weaver river sluices * Jan 9 * Mar 6, 13 * July 17, 24 * Aug 21 * Oct 2 * Nov 6, 27-**91,** prog. * May 13 * Aug 12, 19, Sep 16 * Nov 18-**92**

MARNE & Saone, Florentin, abs. *Inst C E* v 105 -**91,** *An Trav Pub* -**91**

MERCED irrig *E News* Feb 4-**88**

MICHIGAN & Superior lakes, proposed, maps *E News* * Mar 22-**90**

NEW York, state imp. *E News* Aug 18-**92**; & Phila. ship (Del. & Raritan rivers), proposed, Haupt, inset *F Inst* * Mar -**92**

NICARAGUA ship *Eng* Menocal * Aug 22, Dec 26-**90**

E & Min maps (full) * May 4-**89**

E News surveys, June 16, ed. n 30, Menocal * July 7, 14 ed. 14, Peary, Aug 18, 18-**88,** map and inset * Sep 14, 14-**89,** proposed guarantee, ed. Feb 7, notes * May 30, * June 6, ed. 6, 13, 20, 27-**91**; engineer's report and ed. Dec 15, 15-**92**; *E Rec* May 23-**91**

F Inst and Panama, notes, Oct -**88,** Taylor, Jan, profile * Feb, Am. Isthmian routes, Ammen, Dec -**89**; Davis, inset (full) * July, Aug -**92**; Diebitsch *Lehigh Eng* Feb -**89**

Canals, NICARAGUA

Forum Miller, Merry, Feb -**92**; *R Gaz* Aug 29-**90**

Sc Am Sup (full) * Feb 2, 16, 16 * Mar 2-**89**, Peary, Jan 11, 18-**90**

The Eng Feb 17-**88**, * June 12 * July 3, Aug 14, Nov 6, 27-**91**

NORTH Sea, Amsterdam, Huet, abs. *Inst C E* v 99 -**90**, * *Tijd Konin Ing* -**88-89**. See also CANALS, Baltic

PANAMA interoceanic ship, plant and material, Williams, insets (full) *Am C E* * v 19 -**88**; Isthmus canal and our Gov't. *Atlan M* Mar -**89**

Eng Rogers Apr 20, June 8, ed. Dec 21-**88** * Jan 11, locks, inset * Nov 1-**89**, directors, ed. Nov 25-**92**

E News locks, proposed * Feb 11 * Mar 10, actual status, profiles, ed. etc. * June 2, 2, water supply 16, what the Slaven dredges are doing, Appleton, cor. 16, actual status, Snow, great Culebra cut, ed. * 16, 16, recent trip over, Lockett, 23, and Nicar., ed. July 14, prog., cor. 28; Aug 11, de Lessep's report, ed. 18; plant and machinery, Williams * 18 * 25; financial status, ed. Dec 8-**88**; cost, etc. Oct 19-**89**

E Rec Rogers (full) * Jan 28-**88**; McAlpine's opinion, Feb 22-**90**; completion, report, May 30-**91**; *The Eng;* works, Nansouty, abs. *Inst C E* v 92 -**88**, * *Genie Civil* v 12 -**88**; (cost) *R & Eng* Feb * June -**91**; new, Crowell, cor. *R Gaz* Oct 28-**92**

Sc Am Sup work on * Mar 10, locks * 31, * July 21 * 28 -**88**, * May 25, Wins (very full) * June 1, 8, 15-**89**, projects for completion, Malgarini's * Nov 12-**92**

PECOS Valley, New Mexico *E News* * Oct 17-**91**

PENN., L. Erie & Ohio river, proposed *E News* * Mar 21, do. *R Gaz* Apr 10-**91**. See also CANALS, Lakes

QUEBEC-Montreal ship channel *Sc Am* Mar 16-**89**, *Eng*

RICHMOND, Va., eng. problem at, Adams *Am M E* * v 12 -**91**

SAULT Ste. Marie, ed. *Eng* Sep 14-**88**, Sep 5-**90**; *E News* Jan 4, traffic for nine seasons, Mar 1-**90**; lock accident *R & Eng* * Oct -**90**; and Suez, traffic *R Gaz* Apr 17-**91**; *Sc Am Sup* Oct 20-**88**

SIBERIA, new waterway, abs. *Inst C E* v 92 -**88**, *Osterreich Ing* -**88**; Mas *R & Eng* Sep -**89**, *An Ponts*

SIDHNAI system, MacLean, abs. *Inst C E* v 103 -**91**

SPAIN, inland nav., abs. *Inst C E* v 104 -**91**, *An Construct* Madrid -**90**

Canals, SOUTH Yorkshire junction, proposed *The Eng* * Oct 17-**90**
SUEZ, traffic growth *E & Min* Apr 20-**89**; ships passed through *E News* Apr 28, June 9-**88**, report, July 6-**89**, traffic diagram * July 11-**91**; and Sault Ste. Marie traffic *R Gaz* Apr 17-**91**; lighting of *The Eng* * Dec 6-**89**
SUPERIOR & Mich. lakes, proposed, maps *E News* * Mar 22-**90**
WASTE weir, aut., Foote, inset *Am C E* * v 18 -**88**
Canes and sticks manuf., Jackson *Sc Am Sup* May 11-**89**; cane contrivances * Nov 26-**92**
Canning fruit *Sc Am Sup* Jan 4-**90**
Capital and labor, the rights of *Blackwood's Mag* Dec -**91**; conflicts, Howell, bk. review *Eng* Aug 29-**90**; the remuneration of, ed. Dec 11-**91**; does capital need high-priced labor, Partridge *E Mag* Aug -**92**; how to secure harmony between, Hewitt *E & Min* Oct 11-**90**, *Am Min*; the consumer, Rice *Forum* July -**92**; are business profits too large, Mann *Pop Sci* Nov -**92**. See also LABOR; MANUF. industries net profits
PROFIT-sharing, co-operation, B. Jones *Eng* Sep 19-**90**; industrialism, Esson *El Rev Lond* Nov 7, 14-**90**; gain-sharing Towne *Am M E* v 11 -**89**; profit sharing enterprises, ed. *Eng* Feb 13, ed. July 31-**91**, Gilman *Soc Arts Mass* -**89**
Carbon, bisulphide manuf. and purification, Singer (full) *Sc Am Sup* * Apr 20-**89**; funnel, for filtering, Drown *Tech Q* May -**88**; heat of combustion, Berthelot *R Gaz* July 26-**89**, *Compt r*
Carbonic acid liquid manufacture *Sc Am Sup* * June 27-**91**
Carborundum, Guy *Sc Am Sup* July 16-**92**
Carnegie, Andrew, por. *E & Min* * July 4-**91**
Carpenter, R. C., por. *Cassier's* * Jan -**92**
Carpet beating machines *Sc Am Sup* * Apr 21-**88**; industry, Phil. Apr 13-**89**; weaving, Persian, Vries, Aug 29-**91**, *J Soc Arts Lond*
Carr, Henry *Inst C E* v 95-**89**
Carr, Mark W. *Inst C E* v 93-**88**
Carriages, elastic traction, Lemoine's *Sc Am Sup* * Oct 8-**92**; torsion in, King *The Eng* * Aug 28-**91**
Carrick, John *Inst C E* v 101 -**90**
Cars and carriages, Railroad, rolling stock, Paris exhib. *Eng* Aug 30-**89**, local R's, inset * Apr 4-**90**; standards, good and bad *E News* June 9-**88**

Cars, ACCOUNTANT'S Assoc. pro. *R Gaz* June 29-**88**

AXLES, steel, Coffin *Am M E* * v 9 -**88**; effect of temp. on strength, Andrews *E News* * Feb 18, 18, 25-**88**, Nov 14-**91**, do. inset *Inst C E* * v 94 -**88**, insets * v 105 -**91**; and wheels, machine for rolling, Aitken's ap., pats. *R & Eng* * Sep -**90**; wheels and track, discuss. *R Gaz* Feb 17; 60,000-lb. cars, standard, proposed * June 8-**88**, do. Rhodes and ed. * Feb 22, 22, Mar 1, discuss. 29, M. C. B. * Oct 11; steel, tests, Pencoyd works, Nov 8-**89**

AXLE and journal-boxes, lubricating, cost, Randolph *Am M E* * v 11 -**90**; stamped steel *Eng* * June 20-**90**; Macnee's dust proof *E News* * Dec 15-**88** * May 2-**91**; bearing for 60,000-lb. cars, M. C. B. Assoc. com. report * June 14-**90**

R Gaz anti-friction metals, Bennett, Jan 18, 25; Erie journal-box * Sep 20; and bearings, Adams, Nov 22-**89**; 60,000-lb. cars, proposed M. C. B. * June 20-**90** * June 19-**91**; stamped steel * July 18; standard, proposed * Aug 22-**90**; the Timms *The Eng* Apr 13-**88**

BRAKE, Kane's *Sc Am* Feb 16-**89**. See also RAILROADS, brakes

BRUNIG, Paris exhib. *Eng* * Aug 23-**89**

BUENOS Ayres & Ensenado Port, buffet smoking *The Eng* * Feb 20-**91**

BUFFER, Westinghouse friction *R Gaz* * Nov 2 * Dec 21-**88** * Feb 21-**90**, *The Eng* * Mar 14-**90**

BUILDER'S Assoc., Master, pro. *E News* June 23-**88** * June 13, 20-**91**, June 16 * 23-**92**, reports *R & Eng* * July -**92**, table, inset (full) *R Gaz* June 15 * 22-**88**, June 28, July 5-**89**, June 13 * 20-**90**, June 12, 19-**91**, June 17, inset * 24-**92**

CALEDONIAN R., inset *Eng* * Feb 21-**90**

CATTLE, So. R., France, wagon, Paris exhib., inset *Eng* * Nov 8-**89**; the Canda *R Gaz* * Mar 2-**88**

CHOCK, for stopping *E News* * Aug 9 **90**

CLEARANCE in width required by *R Gaz* * Nov 9-**88**

COAL, Chic. Rock Is. & Pac. standard, inset *E News* * Aug 11 -**92**; Tex. & Pac. *R & Eng* * Nov -**91**; standard * Apr * May -**92**

COUPLERS, standard, dimens. *E News* * Jan 28-**88**; contour lines, etc., Barnes * Jan 3-**91**; breakages, service record and ed. * Feb 15, 15-**90** * May 12-**92**; and brake legislation *R & Eng* Mar, May -**92**; vertical plane, in service, ed. *R Gaz* Jan 17; frt., C. B. & Q., broken * June 6-**90**; vertical plane,

Car COUPLERS
Barnes, and aut. air brakes * Jan 2, Feb 6, ed. 6; what constitutes a defect in ver. plane, discuss. 23, mixed unlocking gear disadvantages * Nov 13-**91**; strength, Forsyth, Mar 4, 11 -**92**
BLACKSTONE'S platform and *R Gaz* * July 15-**92**
BUHOUP'S *E News* * August 25-**92**
CHICAGO, the *R Gaz* * Nov 14-**90**
DREXEL *R Gaz* * May 15-**91**
EMPIRE *R & Eng* * June -**92**
FOX aut. vertical plane *R Gaz* * June 20-**90**
HINSON *E News* * Aug 1-**91**
HUSELTON aut. *R Gaz* * Apr 11-**90**
JANNEY frt., safety stop for *E News* * Jan 2-**92**; *R Gaz* * Feb 17-**88**, vs. Miller, ed. Apr 11, evolution of * June 6, life of, diagrams of broken * Nov 7-**90**, with Bentley's vestibule * May 1 -**91** failures * May 13-**92**
KEYSTONE *E News* * Nov 2, *R Gaz* * Nov 8-**89**
MASTER Car Builder's aut. *E News* introduction of, ed. Mar 28, R's equipped with, inset map * Apr 25, 25 * June 13, standard gauges for * Sep 19-**91**, strength, Forsyth * Mar 5-**92**
R & Eng form of contour lines, report * May -**88**, standard gauges * Oct -**91**, possibilities of, discuss., Eastwick (full) * Apr, May -**92**
R Gaz * Apr 20-**88**, at interchange points, ed. * July 25 * Aug 18, on curves * Oct 3-**90**, broken knuckles * Jan 2, cost, ed. May 15, report * June 12, standard gauge * Sep 18-**91**, M. C. B. Assoc. action, Apr 22, testing machine * Sep 2-**92**
ROBERT-Eastwick *R Gaz* * June 6-**90**
TESTING, method *R Gaz* * Aug 19, testing machine * Sep 2-**92**
THURMOND frt. *R Gaz* * June 5-**91**
TROJAN *E News* * Nov 29, *R Gaz* * Dec 5-**90**
UNION aut. *R Gaz* * Jan 30-**91**
VAN Dorston and buffer *R Gaz* * Dec 14-**88**
DERRICK, 15-ton, Penn. *R Gaz* * Oct 18-**89**, 10-ton, Balt. & O. * Jan 9-**91**
DRAW-bars, height of M. C. B. com. report *E News* June 28-**90**; Graham's draft rigging, Penn. R., discuss. *R Gaz* * Mar 29, 29; Cushing's stop * Oct 25; Chic & N. W. * Nov 1-**89**; Safford aut. * Oct 17-**90**; Butler draft gear * Apr 1; draft gears for frt. cars, Barnes * June 3-**92**

Cars, DUMP, Can. Pac. *E News* * July 21-**88**; rotating * July 12 -**90**; iron, No. R. of France *R & Eng* * July -**88**; the Goodwin * July -**89**; Thacher compressed air * Dec -**92**, do. *R Gaz* * Nov 11-**92**; George's Creek & Cumb. * Jan 25-**89**; and gondolas, Goodwin, Jan 31; standard, B. & A. * Mar 7-**90**

FRANCE, experimental, West. R., Paris exhib. *Eng* * Oct 4; local R's 2d class, Paris exhib. * Nov 29; 1st class, So. R, inset * Dec 13-**89**; State R * July 4-**90**; pass. *R Gaz* * May 15 -**91**. See also CARS, dump—freight

FREIGHT, Goodfellow & Cushman's *Eng* * Dec 7-**88**; unloading by steam shovel *E News* * Oct 5-**89**; construction imp., Barnes * Jan 30; lubrication, cost, Dec 1-**92**

R Gaz relative cost of car load and less, Fink, Feb 3; depreciated values, table, Apr 27: ballast and plow, Roger's * July 27-**88**; equity of per diem and mileage plan, Yardley, Wattson, cor. Mar 15, Apr 5; relative econ. of large and small capac., ed. Apr 26; springs, bolster, tests, Hazlehurst, diags. * Oct 4-**89**; end platforms for, ed. Jan 10: housing for gondolas and stock * Mar 28; ventil., Pancoast's system * Apr 11; mileage decrease on home roads, Wattson, July 11; handling and distrib. on West Shore Oct 10-**90**; Harvey steel box * June 5-**91**; construction and design, Barnes * Jan 29, Lamont's steel * Feb 5-**92**

BALT. & O. 50,000-lb. box, details *R Gaz* * Mar 27-**91**, iron box *R & Eng* * Dec -**92**

BELGIUM, Grand Cen. R. wagon, Paris exhib. *Eng* * Oct 11-**89**

BUFFALO, Roch. & Pitts. 60,000-lb. box and truck *R Gaz* * Dec 19-**90**

CHESAPEAKE & O., combination *R Gaz* * Feb 1-**89**; stone * Sep 23-**92**

CHICAGO, Bur. & Q. standard *R Gaz* * June 21-**89**; & N. W. standard, 50,000-lb., box (full) * Jan 10-**90**; Rock I. & Pac. coal, standard, inset *E News* * Aug 11-**92**

DENVER & Rio Grande box, standard gauge *R Gaz* * Oct 9-**91**

FRANCE, So. R. cattle wagon, Paris exhib., inset *Eng* * Nov 8, platform wagon, do. * Dec 20-**89**

GERMAN composite *R Gaz* * Dec 27-**89**

HOELLENTHAL R., inset *Eng* * Mar 13-**91**

INTERCHANGE rules *R Gaz* May 24-**89**, com. report, May 22 -**91**

LAKE Shore, 30-ft. standard *R Gaz* * Dec 30-**92**

Cars, Freight, LEHIGH Valley, 50,000-lb. standard *R Gaz* * June 8; twin hopper bottom gondola, 60,000-lbs. * Sep 14-**88**; 50-ton capac. platform car * Aug 16-**89**

NEW York, L. Erie & W. side-dump, 80,000-lbs. capac. *E News* * Apr 19, 19-**90**

NEWPORT News & Miss. Valley gondola *R Gaz* * Apr 6-**88**

NORTHERN Pac. hopper side chute *R Gaz* * Apr 5-**89**

PENN. 100,000-lb. *R Gaz* * May 11-**88**; 40-ton side-dumping gondola * Mar 15-**89**

SPAIN, 13-ton iron ore wagon, Parcocha R., inset *Eng* * July 17-**91**

TUBE-frame, Jefferds *Eng* Nov 7 * 28-**90**, do. goods wagons, insets (full) *Inst M E* * Oct -**90**, do. cor. *R Gaz* June 5-**91**, do. and effect on expenses of R's *The Eng* * Nov 14-**90**

GATES, the Gold platform (N.Y. eleva. R.) *R Gaz* * Nov 30-**88**; B. & A. * Mar 21-**90**

GREAT So. & W. of Ireland, composite *Eng* * Oct 19-**88**

GREAT Western, England, corridor cars *E News* Mar 26 * Apr 28, *The Eng* * Apr 15-**92**

HEATING, Bache's heater, com. report *F Inst* * Aug -**88**; Leland hot water heater *R Gaz* * Sep 11-**91**; hot water continuous, Safety Co. * Sep 6-**89**

STEAM, notes on, Baldwin, a safety system, Towne *Am M E* * v 9 -**88**; safe train system, Gibbs' car *El Wld* * June 21 -**90**; appliances *Eng* * Mar 4-**92**; Waitt *E & Min* * Oct 1-**92**

E News steam from the locomotive, com. report, June 30; Baldwin * Aug 18-**88**; non-pressure system * May 18-**89**; by direct steam, June 7 * Nov 22: prog. of steam heating, inset map and ed. (full) * June 7, 7; Consol. Car-heating Co. systems * Sep 6, do. aut. temp. regulator, 20-**90**; diagram * May 16-**91**; standard couplings * June 16; Waitt, Sep 29 -**92**; P. Atkinson *Lehigh Eng J* June -**89**

R Gaz aut. control of heat, Temple, Apr 13; expts., discuss. 20 * May 18; Stand. Car Htg & Ventil. Co. continuous system * June 15; M. C. B. expts., report, inset table and ed. 22-**88**; essential elements of, W. Johnson, Feb 1; continuous, cir. replies, Mar 22, Apr 12-**89**; Consol. Car H. Co. couplings * May 2; econ. of, Sewell, Nov 7-**90**; Halladay, Sep 23, Waitt, 30-**92**; econ. of, Sewall *Sc Am Sup* Nov 29 -**90**; Lanza * *Soc Arts Mass* -**89**, *Tech Q* * Oct -**88**; and couplers *The Eng* Jan 27-**88**

Cars, Heating, Steam, CALEDONIAN R., exhaust steam ap., Drummond *Inst C E* * v 92 -**88**, *The Eng* * Jan 4, 4-**89**
CHICAGO, Mil. & St. P. contin. *R Gaz* * Jan 13-**88**, light and heat tender (full) * June 13-**90**
ERIE system *R Gaz* * Feb 3-**88**
GIBBS' safe train system *El Wld* * June 21-**90**, steam hose coupler *E News* * Dec 5-**91**
GOLD continuous system, Lehigh Valley *R Gaz* * Mar 9; storage, test, May 11-**88**; * Aug 30-**89**; coupling and joints * Mar 21; * June 6; coil and Baker stove * Dec 26-**90**
MARTIN coupling *R Gaz* July 18-**90**
MCELROY system, test *R Gaz* Apr 6-**88**
NORTH Western system, coupling and trap *E News* * Mar 30 -**89**; *R Gaz* * Jan 27-**88**
PENN. R., Ely *E News* * Nov 15, *F Inst* * Nov *R & Eng* * Dec -**90**; Williams' system, expt. *R Gaz* Feb 24-**88**; continuous * Mar 22-**89**
ROBERTS' system, *R Gaz* * Apr 17-**91**
SEWALL contin. system, hose coupler *E News* * Nov 21-**91**; *R Gaz* * Jan 20-**88**
WILLIAMS' system, Penn. R., expt. *R Gaz* Feb 24-**88**
INDIAN State carriages, Rajah *The Eng* * Nov 4-**92**
INSPECTION, Susque. Coal Co. *E News* * Aug 17; Penn. R. * 31-**89**; the Ionia *R Gaz* * Apr 26-**89**; joint insp., com. report, June 19-**91**; saloon, So. E. R. *The Eng* * Aug 14, 21-**91**
INTERCHANGE rules, M. C. B. report *R Gaz* Apr 8-**92**
IRON and steel, construction, steel plate and malleable iron in, M. C. B. report *E News* * June 14-**90**; steel stock car, inset * July 11-**91**; iron con., pros and cons, ed. May 19-**92**; iron dump frt., No. R., France *R & Eng* * July -**88**; iron box, B. & O. * Dec -**92**; iron construction, Ettenger *R Gaz* Nov 30 -**88**; Am. steel fire-proof postal * Jan 4-**89**; Schoen pressed steel, inset * May 23-**90**; steel in car construction, Mar 27; Harvey steel box frt. * June 5; pressed steel and malleable iron con., com. report * 12-**91**; construction and design, Barnes * Jan 29; Lamont's steel * Feb 5; Harvey steel construction * 26; iron and steel box, Mex. R. * Aug 5-**92**. See also CARS, tube-frame
LAKE Shore & Mich. So. standard pass. *R Gaz* * Sep 16-**92**
LIGHTING, electric, Leonard *El Eng* July 9-**90**, Bauer, June 8-**92**, Timmis *El Rev Lond* * Sep 11-**91**, do. *El Rev* Jan 11-

Cars, LIGHTING

92, with storage (secondary) batteries, A. Brown *El Wld* * June 1-**89,** Bauer, June 11, Silvey storage battery system * Dec 31-**92,** Sartiaux *Eng* * Oct 25-**89**

E News, systems, cost, ed. and cor. May 25; with storage (secondary) batteries, A. Brown, July 6-**89**; electric, Penn. R., inset * Aug 23, do. Sartiaux, Nov 1-**90**; modern methods and ed. Mar 7, 7, 14, comparative merits, various systems * Apr 18, 25 * May 2-30 * Aug 15, 22, the Pintsch compressed gas system * 29 * Sep 5, 19, 26, oil lamps * Oct 10, 17, electric * Nov 14, 21 * Dec 5, 19-**91,** Mar 12-26, Apr 2, 9, and ed., **16**, 16, Bauer, June 9-**92**

Inst C E electric, Sartiaux, abs. v 101 -**90**; Langdon, discuss., inset * v 106 -**91**; *An Telegr* v 17 -**90**

R Gaz electric, Timmis * May 18-**88,** ed., Feb 8, Waite, Mar 1, Frost dry carburetter system, Penn. R. * June 7, elec. light car, Cumb. Val. * 21, elec., Selden, Oct 25, elec. in Am. and Europe, Sartiaux, Nov 29-**89,** by power from the axles, arr., Lond., Brighton & So, Coast R. * Jan 3, Gibbs, * Feb 7, light and heat tender, Chic. Mil. & St. P. (full) * June 13, elec., Leonard, July 11; Frost carburetter tests * 18-**90**; Gibbs elec. (full) Mar 6, (cost, various systems) cor. Aug 28-**91**

LONDON & S. W. works, Eastleigh, England, *Eng* * July 29; bogie composite * Aug 5-**92**

LUBRICATION, Hall *E News* * June 27-**91**; lubricants, English, and testing *R Gaz* * Feb 14-**90**

MEXICAN R. iron and steel box *R Gaz* * Aug 5-**92**

PAINTING, Master Car & Locom. Painter's Assoc. pro. *R Gaz* Sep 20-**89,** Sep 19-**90,** Oct 2-**91**; M'Keon *Sc Am Sup* Oct 1-**92**

PLATFORM, Miller, and coupler patents *R & Eng* * Jan -**88**

PORTABLE partition *E News* * May 30-**91**

PASSENGER, Hoellenthal R., inset *Eng* * Feb 27-**91**; Am. compartment, Wagner Co. *E News* * June 16, special, World's exhib., inset * Nov 17-**92**; Pullman vestibule sleeping *R Gaz* * Nov 23-**88,** Pullman, imps. * Feb 14; Farmer's, with side entrance * Sep 19; Wagner compartment sleeping * Oct 31; Harris sleeping excursion 'Jeannette,' inset * Nov 28-**90**; Bissell 'Gould' platform and vestibule * Mar 18; (various roads) dimensions, Dec 30-**92**; Pullman train in England, ed *The Eng* Dec 14-**88.** See also CARS, under names of R's.

Cars, REFRIGERATOR, Zimmerman aut. *R Gaz* * Jan 20-**88**; the Hanrahan * Oct 30-**91**

REPLACER, Reed's *E News* * Jan 26-**89**; the Norwood * May 17-**90**; Hynes *R Gaz* * Jan 3-**90**. See also BRIDGES, Railroad, guards — rerailers

ROOFS, M. C. B. com. report *R Gaz* * June 22-**88**; Woods, Feb 12-26-**92**

SCHOEN pressed steel, inset *R Gaz* * May 23-**90**

SEAT, Forney's *R & Eng* * June -**89**; the Emmert *R Gaz* * Mar 23-**88**

SERVICE, Wattson *R Gaz* Jan 23-**91**; settlements, ed. Jan 29-**92**. See also RAILROADS, demurrage

SIGNALS, between pass., guards and engine driver, Urquhart, inset *Inst C E* * v 106 -**91**

SILL repairs and general averages *E News* Aug 11-**92**

SLEEPING, discomforts of, ed. *R Gaz* Jan 3-**90**

SOUTH Eastern, England, Am. for, inset *Eng* * Oct 30, 30 inset *E News* * Oct 10; inspection saloon *The Eng* * Aug 14, 21-**91**

SOUTH Mahratta R., 3d class bogie *The Eng* Feb 3-**88**; composite, inset * Mar 20-**91**

STOCK, steel, inset *E News* * July 11-**91**

TRANSFER str. Ann Arbor *R Gaz* * Aug 19-**92**

TRUCKS, electric *El Rev Lond* * July 11-**90**; spring tip, for heavy rock *E News* * Oct 5-**89**; devices for side motion in * Jan 17-**91**; standard frt., Harvey Steel Car Co. * June 16 -**92**; Jewett metal *R Gaz* * June 14; Rich. & Dan. R. * Sep 13-**89**; Fox solid pressed steel pass., inset * June 6; safety chains, ed. Aug 15, fastening, proposed, lateral motion, ed. * 22, ed. * 29, ed. * Sep 5; swing beam and rigid and flange wear of wheels, discuss. 26, Nov 14, ed. Dec 5-**90**; radial, errors in theory, ed. Feb 13; Barber roller bearing * 20; Fox solid pressed steel * Mar 27; radius bars, length, Woods * May 15; 50,000-lb. N. Y. Cen. standard * June 5-**91**

TUBE frame, Jefferds, cor. *Eng* Feb 12-**92**. See also CARS, frt., tube frame

VESTIBULE, Pullman sleeping-car *R Gaz* * Nov 23-**88**; Howard's * Mar 27; Barr's, Chic. Mil. & St. P. * July 17-**91**; and Bissell 'Gould' platform * Mar 18-**92**

WHEELS, and rail sections proper relation, com. report (full) *Am C E* * v 19 -**88**; flat topped rails and cyl., Whittemore, com. final report, insets (very full) * v 21 -**89**; good and bad,

Cars, WHEELS
report *E News* May 19; crushing strength per sq. in., ed. 26 -**88**; worn, mileage of, Penn. R., diagram * Jan 12; and axles, condemning, Penn. R. rules, Mar 9; M. C. B. standards, Aug 3-**89**; discuss. Feb 22; machined, N. Y. Car. W. works, July 12 * 19-**90**; sections, Griffin * June 27-**91**; cracked plates, cause (full) * Oct 13-**92**

Inst C E wear of tires and rails on curves, Helmholtz, abs. v 93 -**88**, *Zeit deut Ing* -**88**

R & Eng steel tired, new method * Feb, foundry plant, Whiting's * May, Griffin grinding machine * Dec -**89**; and axles, Aitken's ap. for rolling, pats. * Sep -**90**; guarantees, Griffin, Sep -**91**

R Gaz axles and track, discuss. Feb 17; Snow, 24, Peckham paper * 24 * Mar 2; steel-tired and chilled, Mass. R. Com's report, May 11; method of comparing cost, June 1; safe (cost etc.), ed. May 25; the contracting chill in wheel making, Barr * Dec 28-**88**; cast iron chilled, and ed. Jan 11; flat-topped rails and cyl. wheels, Whittemore * 25; 33-in. standard * Mar, 8; and rails, form of, report * May 17, June 28; cast iron, specs., M. C. B., report, July 5; contracting and non-contracting chills, discuss. Nov 15-**89**; chilled, form of contract for, Feb 14, Mar 21, Whiting foundry plant * July 11-**90**; best diam., Porcher, Feb 27: imps., Griffin, Mar 6; counter, Schilling's * 20; sections and mechan. conditions, Griffin, June 12; rolling machine, Jones' * Oct 9-**91**; record, Barr, Oct 14-**92**, *J Assoc E Socs*

Sc Am Sup R. Hunt (full) * Aug 2, 9-**90**; best diam., Porcher, Mar 21-**91**; chilled iron and steel-tired, proper method of comparing cost, Swain *Tech Q* May -**88**; Peckham paper *The Eng* * June 7-**89**. See also LOCOMS., driving wheel tires

WINDOW, De Kalb's ventilating *R Gaz* * July 25-**90**

Cartridge machinery *Eng* * Oct 10-**90**

Casting, first made in Am., Woodbury *E News* * Dec 1, *Iron Age* * Dec 8-**92**

Cast iron, aluminum in, Keep, ed. *Eng* Aug 31, 31; influence of al., do., Mabery, Voice *E & Min* * Aug 18, *Sc Am Sup* * Sep 8-**88**; and steel, internat. stresses in, Kalakoutsky *The Eng* June 15-**88**

AMERICAN foundry, notes, Keep *Sc Am Sup* June 16-**88**, *Industries*

Cast iron, ARTISTIC treatment of, Lethaby (full) *Sc Am Sup* * Apr 12-**90.** *J Soc Arts Lond*

MANGANESE in, Keep (full) *Am Min* * v 20 -**92**

MECHANICAL purposes, for, Deny, abs. *Inst C E* v 92 -**88,** *Indus Soc Mul* -**87**

PHOSPHORUS in, Keep *Am Min* * v 18 -**90**

ROLLET process *Eng* * May 16-**90**

SILICON in, Keep (full) *Am Min* * v 17 -**89,** *Eng* * Aug 2, 9, 23, 30-**89**; and sulphur in, Turner, May 18-**88**

STRENGTH, resilience, tests and specs., J. Johnson, discuss. (full), insets *Am C E* * v 10 -**89,** v 22 -**90,** abs. *Inst C E* v 101 -**90,** *Eng* * July 4-**90,** *R Gas* * Sep 13-**89**; tests, Lanza *Am M E* * v 10-**89,** *Tech Q* Dec -**88.** See also MATERIALS, strength; TESTING

STRESSES, internal, Kalakowtzky *Sc Am Sup* * Feb 18, 25-**88,** *The Eng*

Castle, Henry J. *Inst C E* v 107 -**92**

Castle life in the middle ages, Blashfield *Scribner's* * Jan -**89**

Catalogues, trade *The Eng* Apr 27-**88**

Cattle lairage, Woodside, Birkenhead *Eng* * May 20-**92**; pen and shed, Great No. R. *The Eng* * Oct 28-**92**

Cavendish, W. (Duke of Devonshire) *Inst C E* v 107 -**92**

Cellulose, or wood fibre, Sadtler *F Inst* May, *Sc Am Sup* June 4-**92**

Cements, mortars and concretes, compressive strength and settlement of masonry, com. report, insets *Am C E* * v 18-**88**; hot tests for portland, Maclay, discuss., inset * Oct 27-**92**; testing, strength of, Sondericker, Lanza, influence of sugar on, Parsons *Am M E* * v 9, 9-**88**; cement rock and gypsum deposits in Buffalo, Pohlman *Am Min* * v 17-**89**

Eng concrete, in seawater, Messent, report, Jan 27, sugar in, Parsons, 27 * Feb 3-**88**; grinding machinery and mill house * Jan 30; Porta works, Bremen * July 17; portland, tests, in Australia, Mons, cor. Oct 2; cement burning notes, 23; manuf. and util. of waste products, Taylor, cor. Nov 6; portland and concrete, Bamber, Carey, W. Smith, 27, in harbor works, 27-**91**; concrete and masonry, cost *E Mag* July -**91**

E & Min and mortar permeability, Haupt, Apr 27; natural cements, Cluss, June 15-**89**; portland, manuf. from slag * May 24-**90** * *Industries;* relative value, Lameson, Remley *E & Min* Mar 7, *Pop Sci* Mar -**91**

Cements

E News econ. in composition of, I. Baker * Mar 10, and stone, crushing strength, do. June 23-**88**; permeability, Haupt, notes, Apr 6; portland, Austrian, testing, Aug 10; manuf., Grosclaude, Dec 7-**89**; concrete beton, tensile strength of tests, May 17-**90**; imp. in clips for * Dec 20; does salt water increase strength of, tests, 20-**90**; testing, St. Louis waterworks lab., S. Russell * Jan 3; hydr. lime, Roman, portland, Engler, A. Brown, Feb 7, 14; portland plant, Rochester, England, Neate * Mar 21; effect of salt in mixing, Powers, Nov 21, microscopic tests, A. Brown, inset * 21-**91**; mortar and beton, sand and stone used for, Feret, Mar 26; concrete plant, Cascades canal * June 2; testing sieves, variations in, Sabin, 30; the cement 'bacillus,' Michaelis, Oct 13; grips cushioning table * Dec 22-**92**

E Rec cement industry, U. S. Mar 17; mortars, Kuichling, report, 24, 31, Apr 14, 21; strength, Baker, May 5; and mortars, antique and mod., Cluss, Nov 17, 24, Dec 22-**88**; mortar vs. lime, Baker, Sep 27-**90**; Neate's grinding machinery * Feb 28; concrete and masonry, cost, Chibas, Apr 11; portland, data, Brown, May 30; mortars and concretes, notes, Grant, Nov 28, Dec 12-**91**; permeability of, Haupt *F Inst* * Mar, do. and mortars, Hyde-Smith * Sep -**89**

Inst C E abs., German testing rules v 91, influence of low temp., abrasion of, and mortars, Böhme, v 92, 92, compressive strength, prog. com. report v 93 -**88**, *Deut Bauz* -**87**, *Jurnal Min St Peters* Jan -**88**, *Mittheil Berlin* -**87**; slag-cement manuf., Grosclaude, Isère manuf., Gobin *Inst C E* v 98, 98 -**89**, *An Indus* July 21, *An Ponts* v 17 -**89**; Pozzolana, portland and Roman, expts., Boehme *Inst C E* v 103 -**91**, *Mit tech Ver Berlin* -**90**; manuf., use and testing, Bamber, discuss. (very full), inspection, Carey, influence of seawater on mortar and concrete, W. Smith, portland, behavior in seawater, Michaelis, at Havre Port, since 1870, Quinette *Inst C E* * v 107, 107-**92**; natural and artif., Griffin *Pop Sci* June -**90**

R Gaz use of, Burnett, Nov 16: portland mortars, decomposition by seawater, Durand-Claye, abs. Dec 28-**88**; mortar, notes, Baker, Sep 12-**90**; mortars' tests, Gillmore, Sep 4-**91**; natural cement mortars' tests * Apr 1-**92**

Sc Am Sup cement concrete, Lundie, Apr 28; from waste product lime, Rigby, June 16; mortar and beton manuf. ma-

Cements
chine * May 12-**88**, *Rev Indus; J Assoc E Socs;* portland manuf. from slag *Industries, Sc Am Sup* * May 31-**90**; magnesia, applic., Weber. May 16; portland and concrete, Bamber, Dec 19-**91**
Soc Arts Mass hydr., natural and artif., comparative values, Cummings -**88**; cohesive construction, hist. and theory, Guastavino -**90**; strength testing, Sondericker *Tech Q* * Dec -**87**
The Eng tests at long dates, Lancaster, Apr 6; hydr., chem. hardening of, Sep 21, Oct 5; portland, mortars and decomposition by seawater, Durand-Claye, Nov 9-**88**, *An Ponts;* and mortar, saccharine matter in, and on building in frost, Crompton, cor. Jan 18, Feb 8; cement mills, overhead driven, Goreham * Oct 11, 11-**89**; manuf. plant, English * Sep 26 * Oct 10, 10-**90**; portland, Stoke's contin. cement making ap. * Jan 16; port. and concrete, Bamber, Carey, Nov 20; port., current fallacies concerning, ed. Dec 18-**91**; 'overburnt' cement, Dec 2 -**92**. See also CONCRETE

Census counting and taking, Hollerith's electric tabulating machine and system (full) *El Eng* Nov 11-**91**, (full) *El Rev* * Jan 26-**89**, Martin *Tech Q* Apr -**92**; a permanent department, Atkinson *E Mag* Dec -**91**. See also COUNTING ap.

Centenarians *Sci Am* Nov 10-**88**

Centrifugal force, phenomena, Emery *Cassier's* Mar, do. *Pwr* Mar, do. (full) *Sc Am Sup* Feb 27-**92**; and theory of propulsion, Vogt, cor. *Eng* May 2-**90**; and the fly-wheel, Weightman, cor. *R Gaz* * Apr 22-**92**

Centrifugal pumps. See PUMPS, centrifugal
VENTILATORS, expts., Norris (full) *Am Min* * v 20-**92**

Chabot, Cyprien *F Inst* Jan -**90**

Chains, Oury's weldless steel *Eng* * May 1-**91**; Triumph chain making machine (full) * Sep 30-**92**; crane chain expts., Dutton *E News* * May 17-**90**; weldless steel *R Gaz* * May 15, (full) *Sc Am Sup* * Sep 12-**91**

Cheever, Byron W., Pettee *Am Min* v 16 -**88**

Chemical indus., Am., development of, Wyatt *E & Min* Jan 28 * Feb 4 * Mar 3, 10 * Apr 21, 28, May 5 * 26-**88**; analysis, cause of discrepancy, Dudley, Dec 24-**92**; theory, prog., Frazer *F Inst* Apr — June -**91**; notes * Jan -**89** and files; recent science, Kropotkin 19*th Cent.* Aug -**92**; prog. *Sc Am Sup* Sep 15-**88**; Internat. Congress, Nov 16-**89**; elements, genesis

Chemical

of, Vernon, Apr 5; research, new method, Gore (full) * Aug 23, 30-**90**; Chem. Soc., Lond., pro. Apr 4, 11-**91**; Burgoyne's works *The Eng* Aug 24-**88**

Chemicals, 1889 *E & Min* Jan 4-**90**, Jan 3, 10, manuf. prog., Lunge, Apr 25-**91**; and market review, 1891, Jan 2-**92**. See also names, SODA nitrate, etc.

Chemist, life work of a (Pasteur), Roscoe (full) *Sc Am Sup* Dec 14-**89**

Chemistry, Watts' Dictionary of, bk., Lond. v 1 -**88**; new basis for, T. Hunt, bk. review *E & Min* Jan 24-**91**; thermal, Pourcel *Eng* June 7-**89**; what engineering owes to chemistry, Griswold *E Mag* Nov -**92**; common uses of the rare elements, Waller *E & Min* May 2-**91**; synthetic, debt of medical and san. science to, Sadtler *F Inst* Mar -**89**; notes *F Inst* files -**88**-**92**, do. W. Smith *Sc Am Sup* Jan 7-28, Feb 11 and files; industrial prog. Jan 23; exam. questions, July 16; teaching of, Michaud, Aug 20-**92**; indus. prog. *Am Chem J*; and allied industries *J Soc Chem Indus*. See also ALCOHOL; ALKALI; ALUMINUM and alloys manuf; AMMONIA; BLAST furnaces, chem. reactions; BUTTER, composition; CARBON bisulphide manuf: COLORS; DYES; EXPLOSIVES; FERTILIZERS; FLUORINE; HYDROGEN; INDEX chem. literature; LIME sulphite fiber manuf; NITRATES; OXYGEN; PEARLS; PHOTOGRAPHY; SILK; SOAP; STARCH; STORAGE batteries; SUGAR; SULPHUR; SULPHURIC acid; TANNING, etc.

ACETONE decomposition with bleaching powder, Orndorff *Sc Am Sup* Jan 26-**89**

ALIZARINE assistant preparation, Kendall *Tech Q* May -**88**

ALKALI market, 1889, review *E & Min* Jan 18-**90**

AMMONIA constants, Strombeck *F Inst* * Dec -**90**; det. of heat of evap. of liquid, do. sup. June -**91**

ANTISEPSIS and putrefaction, chem. of substances taking part in, J. Thomson *Sc Am Sup* Mar 3-17-**88**, *Soc Arts Lond*

APPLES, chemical constituents *Sc Am Sup* July 12-**90**

ARSENIDES, metallic, oxidation by elec. current, Frankel *F Inst* Dec -**91**

ATOMIC weights, table *Sc Am Sup* May 23-**91**, Apr 2-**92**

AZOIMIDE, new sodium salt (explosive) *Sc Am Sup* Jan 9-**92**

BENSOL constitution, Noyes *Tech Q* Sep -**87**

BENZYL cyanide condensation, Frost *Tech Q* May -**89**

Chemistry, BIOPHENE (organic), Levi *Tech Q* May -**90**
BONE-black, iron in, Terne *F Inst* Apr -**92**
BRINES, specific heat, Strombeck *F Inst* * Aug -**92**
CADMIUM in assaying gold bullion, Whitehead *F Inst* Nov -**91**
CALYCANTHUS Glaucus seed analysis, Wiley *Sc Am Sup* Feb 15-**90**
CARBON, deposition from carb. oxide gas, Elbers *E & Min* Nov 22-**90**; bisulphide, Wins *Sc Am Sup* * Nov 17-**88**; carb. acid gas liquid manuf. * June 27-**91**
CAUSTIC soda lye testing *Sc Am Sup* Nov 23-**89**
CHLORCINNAMIC acids, Mulliken *Tech Q* July -**91**
CHLORIDES in solution, elec. decomp. of *Sc Am Sup* Apr 26-**90**, *Chem Tr J*
CHLORINE, from magnesium chloride, Weldon-Pechiney proc., Dewar *Sc Am Sup* Feb 25-**88**; liquid, Tutton, Nov 29-**90**; estimation in electrolyzed solutions, Norton *Tech Q* Dec -**91**
CHLOROFLUORIDE of phosphorus, new gas *Sc Am Sup* Sep 5-**91**
COLORING matters, quantitative estimation of by absorption spectra, Patterson (full) *Sc Am Sup* * July 26-**90**, *J Soc Chem Indus*
CYANOGEN residual, new *Sc Am Sup* Nov 8-**90**, *J Gas Ltg*
DEGRAS analysis, Simand *Sc Am Sup* June 6-**91**
EGGIO analysis, Boyer *F Inst* Mar -**92**
EIKONOGEN, Meldola *Sc Am Sup* Apr 19-**90**
FERMENTATION, chem. and bacteriology of, Frankland *Sc Am Sup* * Dec 10-**92**
FLUORIDES, heat of formation, Richards *F Inst* June -**91**
GALENICALS, alkaloidal, compar. standard for, Lloyd *Sc Am Sup* July 25-**91**
GLYCERINE *Sc Am Sup* Feb 21-**91**
HYDRAZINE *Sc Am Sup* Apr 6-**89**
HYDRAZOIC acid, new gas *Sc Am Sup* Jan 10-**91**
HYDROBROMIC acid action on tiglic acid, Talbot *Tech Q* July-**91**
HYDROCHLORIC and nitric acids, new spec. grav. tables for, Lunge (full) *E & Min* * May 9-**91**
HYDROGEN, combustion of and atomic wt. of oxygen, Keiser *Sc Am Sup* * Aug 18; reducing in presence of platinum, Cooke, Oct 20-**88**; peroxide, preserv. and commercial uses, Kingzett (full) May 31-**90**, do. Richardson (full) June 11, July 2, Aug 13, Sep 3-**92**, do. solutions, Talbot *Tech Q* Apr -**92**. See also HYDROGEN

Chemistry, INDEX to literature of Angelic and Tiglic acids, 1842-92, Talbot (full) *Tech Q* Apr -**92**; Butines and Halogen addition products, Noyes, Dec -**88**
IODINE absorbed by lard oil, Hames F *Inst* July -**91**
ISOBUTYLENE, action of heat on, Noyes *Tech Q* Feb -**88**
LACTIC acid, new industry *Sc Am Sup* July 18-**91**, *Chem Tr J*
LAPACHIC acid, derivatives of, Hooker *F Inst* Jan -**91**
MAGNESIUM-ammonium phosphate, sol. in alcohol, Wakeman *Tech Q* Dec -**87**
MANGANESE precip. as ammonium mangan. phosphate, McKenna *Tech Q* Nov -**90**
MINERAL waxes, literature of, review, Wurtz *E & Min* Mar 14-28-**91**
NAPHTHALINE and benzol boiling points, Holman, Gleason *Tech Q* Oct -**88**
NITRO-Benzyl Hydroxylamines, Burns, Grabfield *Tech Q* Dec -**88**
NITROGEN, the fixation of, Fawsitt (full) *Sc Am Sup* * July 19-**90**
ORTHODICHLORSTILBENE, Gill *Tech Q* Oct -**91**
OXYGEN, extraction, Murray *Eng* Feb 7-**90**, atomic wt. Oct 7, ed. 28-**92**, *Comp R*; industrial extraction and use *E & Min* * Mar 29-**90**; Parkinson proc. * Apr 30-**92**; manuf., mechan. appliances, Murray, insets, (full) *Inst M E* * Jan -**90**; atomic wt. Keiser *Sc Am Sup* * Aug 18-**88**; Parkinson's gas proc. * June 11-**92**, *Iron*
OYSTER shells analysis, L. Brown *Sc Am Sup* Mar 2-**89**, *Am Chem J*
OZOKERITE, Utah, Seal *F Inst* Nov -**90**
PALLADIUM, electrolytic method as applied to, E. Smith *F Inst* Sep -**90**
PHOSPHORIC acid, Burney, report *Sc Am Sup* July 9; phosphorous oxide, Tutton, 2-**92**, *Nature*
POTASH, Payne, report *F Inst* Dec -**92**; yellow prussiate *Sc Am Sup* Aug 11-**88**
PTOMAINES, Luff *Sc Am Sup* May 12-**88**
ROBINIA Pseudacacia bark, constituent and poisonous prin., Power-Cambier *Sc Am Sup* Mar 15, 22-**90**
SALTS, electrolytic dissoc. of det., Noyes *Tech Q* Oct -**91**
SILICA, det. in silicates by fusion, Gilbert *Tech Q* Feb -**90**; silicates, igneous formation, Elbers *E & Min* June 23-**88**

Chemistry, SODA, bisulphite of, uses, C. Rothwell *Sc Am Sup* Dec 3-**92**

SODIUM and aluminum *Sc Am Sup* Sep 15-**88,** *Eng.* See also ALUMINUM

STANNIC chloride volatility, Drown *Tech Q* * Apr -**92**

SULPHIDES, oxidation of by elec. current, E. Smith *F Inst* * Aug -**90,** *Sc Am Sup* * Dec 27-**90,** *Chem News*

SULPHO-cyanides, electrolysis of, Frankel *F Inst* Feb -**91**

SULPHURIC acid and alkali manuf, prog. *E & Min* May 24-**90**; and sulphurous manuf., Brit. alkali trade, notes (full) Apr 11 * 18-**91**; manuf., Newbury *Sc Am Sup* Apr 27-**89,** *Am Chem J;* sulphurous acid manuf. in Upper Silesia, Eilers *Am Min* * v 20-**92.** See also SULPHURIC acid manuf.

UINTAHITE, a variety of Grahamite, Wurtz *E & Min* Aug 10 -**89**

VANADIUM, occurrence and uses, *E & Min* June 8-**89**

VOLUMETRIC analysis (full) *Sc Am Sup* Nov 7-**91**

ZINC, atomic weight, Morse *Sc Am Sup* * Aug 25-**88.** See also ZINC

Chess board and magic squares, Sturmer *Sc Am Sup* * Apr 27-**89**

Chevreul, Michel E. (French chemist), por. *E & Min* * Apr 20, por. *Sc Am* * 20-**89**

Chicago, Ill. *Eng* Oct 31; Columb. exhib., Dredge, Dec 5, 12 -**90**; as a seaport, maps * Feb 20; elec. lighting * June 19 -**91**; engineering, Chanute *E & Min* Oct 18-**90**

E News business growth, June 30-**88**; st. numbering plan, proposed, Nov 16-**89**; prog. May 3; July 19-**90**; in 1891, stats. May 30-**91**; typhoid fever in, Sedgwick * Apr 21; drainage canal * June 2, 30; railroad terminal and harbor prob. 9; R. grade crossing question * July 21-**92**

E Rec drainage, May 23-**91**; studies of the great west, C. Warner *Harper's* June -**88,** heart of, Heads *N E Mag* July -**92**; deepwater, nav. to Liverpool, Corthell *R Gaz* Mar 6-**91**; harbor, ed. July 15-**92**; rapid transit for, Stoltenburg *Sc Am Sup* * May 25-**89**; as a seaport * Mar 28-**91**; industries and district, Consular report *The Eng* Aug 10-**88.** See also BUILDINGS, World's exhib; EXHIBITIONS, U. S. Columbian; MUNIC. eng; PAVEMENTS; RAILROADS, Chicago; SEWERS; STREETS; TUNNELS; WATER-works, etc.

Chili republic, ed. *Eng* Oct 25-**89**; notes, ed. *E News* Dec 1 -**88**; climatic phenomena, O'Brien *Inst C E* v 109-**92**

Chimneys, design of, Gale *Am M E* v 11 -**90**; area, empirical formula for, diag. *E News* * Dec 7-**89**; workshop, Cordier, abs. *Inst C E* v 96 -**89**, *Bul Soc Min* v 2 -**88**; stability of *Locom* June -**86**, Feb -**89**; various *Pwr* * Dec -**90**; tall, engineering *Sc Am* Dec 1-**88**; construction, various, table dimens. *Sc Am Sup* Oct 19-**89**, *Industries;* for power station *St R J* * Mar -**92**. See also ELECTRIC light stations; RAILROADS, electric power stations; WIND pressure on chimneys

CHICAGO Auditorium bldg. cast iron smoke-stack *E Rec* * Mar 7-**91**

CLARK Thread works, Kearney, N.J., 335-ft. *E News* Nov 10 **88**, Harrison, N.J. *Locom* May, repairing *Pwr* * May -**90**; great *Sc Am* Oct 20, *The Eng* Nov 30-**88**

CLECKHEATON disaster *Eng* * Apr 1-**92**

CREUSOT, France, 279-ft. wrt. iron, novel *E News* May 10-**90**

DRAFT, Peclet's treatment of, Webb, mechan. theory, formulas, tests, Kent (4 papers) *Am M E* v 11 -**90**, Thurston * v 12 -**91**, idiosyncrasies of, Crane v 13-**92**

FALL River, Mass., tall *R & Eng* * Apr -**90**, *Genie Civil*

HALSBRUCKE, Saxony, 453-ft. *E News* Mar 15-**90**; Halsbrueckner works stack, Freiberg, Hueppner, abs. *Inst C E* v 104-**91**, *Oest Berg Huett* v 39 -**91**; highest in world *Sc Am Sup* * Nov 30-**89**, *The Eng* * Apr 11-**90**

NARRAGANSETT Elec. Co., Prov. R.I. *El Rev* sup * Aug 17-**89**, *E Rec* * June 20-**91**, *Pwr* * Oct -**89**, Henthorn *Sc Am Sup* * Oct 31-**91**

ROCOURT, St. Quentin composite iron and brick factory, Guenot, abs. *Inst C E* v 92 -**88**, *Dingler* -**88**, *The Eng* Jan 6-**88**

ST. Chamond, France, tall *R & Eng* * July -**91**, *Genie Civil*

China, mining in, Harris *Eng* Nov 23-**88**; from an eng. standpoint, Aug 19-**92**; and Japan, trade, etc. *The Eng* Dec 7-**88**. See also COAL mines, China, North; MINING, China

Chlorination, Thies proc. of barrel, Egleston *Sc Am Sup* Sep 27-**90**, *Sch Mines Q*

Chittenden, Francis S. *Inst C E* v 100 -**90**

Cholera, how guard against, Shrady *E Mag* Oct -**92**

Chromium *E & Min* Jan 3-**91**

Chronograph, tuning-fork, precision in use of, Webb *F Inst* Sep -**92**

Chronometer rates and how to use them at sea *Eng* July 20, Nov 30, Dec 28-**88**; ship's, hist. and development, Gardner (full) *Sc Am Sup* * June 28-**90**

Chronophotography *Sc Am Sup* * Mar 22, 29-**90**
Chubb, Harry *Inst C E* v 91 -**88**
Cilley, William H., (remarkable career in Peru), Hodges *E & Min* Nov 1-**90,** *R Gaz* Oct 18-**89,** *Sc Am Sup* Nov 16-**89,** Nov 29-**90**
Cincinnati, Ohio *Eng* * Aug 8-**90**
Circle squaring, history, Schubert *Sc Am Sup* Apr 30, May 7-**92**
Cities, *E News*, taxes, U. S. June 1-**89**; revenues from companies performing public functions, ed. Sep 20-**90**; numbering country houses, the ten-block system, Bancroft, Jan 31; Am. laws regulating taxation for st. construction and maintenance, Mar 21; receipts and expenditures of 100 U. S. July 4; refuse disposal in Am. 18; social stats. of Am. Sep 12; laying out and additions to, Dec 26-**91**; munic. gov't in large, Stearns, Feb 27, Mar 5-**92**
E Rec town refuse destruction, Codrington, report * Sep 15, 22, Oct 13, 20, Dec 22-**88**; European, growth, n Feb 21-**91**; steam heating of, Emery *F Inst* Mar -**88**; pass. traffic in great, Croes *R Gaz* * Dec 16, 30-**92**; growth of pop. in *Sc Am* Mar 30-**89**; refuse and garbage disposal, Foster *Sc Am Sup* * Jan 23-**92,** *Eng*; European, pass. transportation in, consul. rep. *St R J* Feb, May -**92.** See also MUNICIPAL eng; PAVEMENTS; SEWERAGE; STREETS; WATER-works, etc.
City engineers. See ENGINEERS, city
Civil engineering. See ENGINEERING, Civil.
Clarke, Henry W. *Am C E* v 26-**92**
Clarke, W. A., (mining) por. *E & Min* * June 20-**91**
Clausius, Rudolf J. E. (full) *Inst C E* v 96-**89,** *Sc Am Sup* Feb 9-**89**
Clays, varieties and qualities for puddle, Gallon *E News* Dec 1-**88,** do. abs. *Inst C E* v 94-**88**; constitution of, Chatelier v 91 -**88,** *Genie Civil* v 11-**87**; clay pipe manuf. *Sc Am Sup* * July 20-**89**; Tallow, Seamon, Sep 27-**90**; kaolin, Blandford, Mass., Crosby *Tech Q* Aug -**90,** do. Ashland, Mass., Hollis, Apr -**92.** See also FIRE-clays
Clayton, James, por. *E & Min* * July 30-**92**
Clayton, Nathaniel *Eng* Jan 2-**91**
Clegram, William B. *Inst C E* v 98-**89**
Cleveland, O., st. traffic tonnage, Torrey *E News* July 28-**88**; st. R's and industries *St R J* sup. * Oct -**92.** See also MUNIC. eng; PAVEMENTS; SEWERAGE; STREETS; WATER-works, etc.

Climatology. See RAINFALL

Clocks, elec., the Hammer *El Eng* * Aug 17-**92**; elec., Mayrhofer's time system *El Rev* * July 5-**90**; for equat. telesc., Lick observ. *Eng* * Aug 17-**88**; Conant's isochronal, Paris exhib. * Sep 6-**89**; iron clock tower construction *E Rec* * Dec 6-**90**; first chronometer *Locom* Apr -**90**. See also TIME, standard; WATCHMAN'S clock

Cloisonne making, Japan *Sc Am Sup* Feb 6-**92**

Cloth dyeing, cleaning and bleach. ap. *Sc Am Sup* * Aug 11-**88**

Cloth pressing machine, Nussey's *Eng* * Mar 6-**91**

Clutches, hydr., Barney *El Rev* * May 7-**92**; Brown's friction coupling *El Wld* * Jan 12-**89**; Snyer's pulley *The Eng* Jan 6; friction, Adams, Sep 7, Pardoe, cor. 21, cor. Oct 5-**88**, do. Edmeston's * Feb 8; spring friction, Megy, Aug 30-**89**

Coal, trade, U. S. and miners' wages, 1888, Ashburner *Am Min* v 18-**90**; and coke, do., U. S. production, stats. 1887 *E & Min* June 16-**88**; stocks, prices, 1888, Jan 12; U. S. produc. 1888, Ashburner, Mar 16-**89**; testing value of different, Kent, July 19-**90**, effic. (full) Oct 10-31-**91**; trade, 1889-90, Jan 3; industry, cen. bull. Feb 21; produc. west of Miss. river, J. Jones, Apr 4-**91**; effic. det. of, Bunte, Sep 24-**92**; world's production of, Swank *E News* Feb 8-**90**; calorific value of, Dentecom, abs. *Inst C E* v 108-**92**, *Zeit deut Ing.* -**91**, culm *Pwr* Sep -**90**; supply *R & Eng* May -**89**; business of Northwest *R Gaz* Nov 18-**92**; how to analyze *The Eng* Apr 20-**88**; and gas trade of London, ed. Sep 20; duration of English supply, Hall, Nov 15-**89**; and labor, tables and ed. May 6, 16-**92**

ALABAMA, coal-fields, development and stats. of, Ashburner *Am Min* v 17-**89**; and iron industries, 1888, Phillips *E & Min* Jan 12-**89**, review do. Jan 3; coal-fields of, McCallen *Sc Am Sup* Jan 10-**91**. See also under COAL mines

AM. cannel, notes on, Macfarlane *Am Min* v 18-**90**

ANTHRACITE, small sizes, prep. and util. of, discuss. *Am Min* v 20-**92**; wt. cu. ft. broken to market sizes, table *E & Min* June 1-**89**; market review, 1891, Jan 2-**92**

PENN., Bernice basin, Sullivan Cty., notes, Claghorn *Am Min* * v 17-**89**; produc., J. Jones report, abs. *E & Min* Jan 17-**91**; field of Pa., Wasmuth *F Inst* Feb -**88**, stratification, inset * Nov -**92**; mine law, Pa. *E & Min* June 13-**91**;

MINING, new method, proposed, Gresley * Aug 17-**89**, importance of tunnels and cross-cuts in, Wasmuth *F Inst* Feb -**88**

Coal, Anthracite, WASTE, util. by gasification in producers, Blauvelt *Am Min* v 20-**92**; Sheafer, cor. *E & Min* Sep 22, Nov 3-**88**; and exhaustion of supply *Sc Am* Oct 6-**88**

BELGIUM indus., 1891, Walleyne *E & Min* Jan 2; produc., Harze, abs. *Inst C E* v 108 -**92**. See also under COAL mines

BITUMINOUS, pyrite in, Brown *Am Min* v 16-**88**; mining, electricity in, Sperry *El Eng* * July 6, (full) *El Rev* * July 23. (full) *El Wld* * June 25-**92**; in Pa., J. Jones *E & Min* June 13-**91**; market review, 1891, Jan 2-**92**

BREAKER, Drifton iron and machin., Coxe, insets (very full) *Am Min* * v 19-**91**; separating and washing plant, Merry colls., inset *Eng* * Feb 13-**91**; plant at Carmaux, France *E & Min* * Sep 6-**90**; separating and washing plant at Zollern, Dortmund, Ger. * July 2-**92**

BRIQUETTE making in France *E & Min* Aug 2-**90**

CANADA, Western, notes, Merritt *Am Min* v 18-**90**

CHINA, North. See under COAL mines

CHOCTAW coal-field, geol. of, Chance, insets *Am Min* * v 18-**90**, *E & Min* * Dec 7-**89**

CHUTE, Burnett & Clifton aut., inset *E News* * Dec 26-**91**

CLEANING, ed. *Eng* July 18-**90**. See also COAL washing

COLORADO, Northwestern region, Hewett *Am Min* v 17-**89**; Col. Coal & Iron Co. report *E & Min* April 4-**91**

CONVEYORS, *Cassier's* * Apr -**92**

CUTTING, elec. mining machines in Ohio, Haseltine *El Wld* * Nov 28 * Dec 5, 5-**91**

DRIFTING machine, Stanley's *E & Min* * Sep 7-**89**

FRANCE and Germany production, cost *E & Min* May 18-**89**

GERMANY, lignite deposits and indus. *Eng* * Mar 22; and France, produc., cost *E & Min* May 18-**89**; indus. Jan 31; iron and steel produc., Ger. Empire, 31-**91**

ILLINOIS, fossil fuels of Comstock *E & Min* July 9-**87**, cor. May 25-**89**

ILLINOIS, Ind., Mich. and Ohio products, '89, J. Jones *E & Min* June 27-**91**

KANSAS and Missouri, thin seams in, Winslow *E & Min* * Feb 13-**92**

KENTUCKY, Western, coals and cokes, J. H. Allen *Am Min* v 16 **88**; product, J. Jones, cen. bull. *E & Min* Aug 8-**91**

MICHIGAN, Ill., Ind. and Ohio products, '89, J. Jones *E & Min* June 27-**91**; New Buffalo coal. station *E News* * Nov 10-**92**

Coal, MINES and mining, the Kaiping mine, North China, Kwang, Silliman, photographing interior of a, Dewey, insets *Am Min* * v 16, 16-**88**; Pratt mines, Tenn. C. & Iron Co., Ramsay, insets, notes on mining in Oregon, Norton * v 19, 19-**91**; elec. mining ap., the Jeffrey *El Eng* * Dec 10-**90**, electricity in bitum. mining, Sperry * July 6, do. (full) *El Rev* * July 23, do (full) *El Wld* * June 25-**92**; elec. applics., Richart * Nov 28 * Dec 5, 5-**91**; Belgium mining *Eng* Dec 12; miners past and present, ed. 19; mining in New So. Wales, 26-**90**; and iron ore mining, U. S., ed. Nov 27-**91**; perils of mining, Norwood *E Mag* * Nov -**91**

E & Min mining machinery, Legg's * June 2; Belgium mining, Gresley * Aug 4-**88**; fossil fuels of Ill. Comstock, July 9-**87**, cor. May 25; Cambria C. & Iron Co. mines, Johnstown, Pa., map * June 8-**89**; accidents in mines * Oct 25: Pratt mines, Tenn. C. & Iron Co., Ala., Ramsay * Nov 22-**90**; safety in mining, Aug 1-**91**; thin seams in Mo. and Kan., Winslow * Feb 13; mining, cost, ed. Sep 10; Mary Lee mine, Ala., Mauchline, Dec 3-**92**; Nova Scotia mining, ed. *E News* Dec 15-**88**

Inst C E Walcher mining ap., Grey, abs. v 92 -**88**, *Bull Soc Min* v 1 -**87**; 3280 ft. deep, near Charleroi, Lemay *Inst C E* v 94, *Genie Civil* v 12 -**88**; Houssu mine, Belgium, shaft sinking by Poetsch freezing proc. *Inst C E* v 96 -**89**, * *Bull Soc Min* v 2 -**88**; North China mines, Kinder *Inst C E* * v 103-**91**; mechan. eng. of mines, Bainbridge, insets *Inst M E* * July -**90**; Ala. mines *Sc Am Sup* Sep 29-**88**; high explosives in mines, ed. *The Eng* Sep 12-**90**; Cadeby mine pumping appliances, Chambers * Oct 21-**92**

MISSOURI and Kansas, thin seams in, Winslow *E & Min* * Feb 13-**92**

MONTANA coal-fields, Weed *E & Min* * May 14, 21-**92**

NEW South Wales, mining in *Eng* Dec 26-**90**

NOVA Scotia mining, ed. *E News* Dec 15-**88**

OREGON, notes on mining in, Norton *Am Min* v 19-**91**

PENN., Cambria C. & Iron ore mines, Johnstown, map *E & Min* * June 8-**89**

PIER, iron, Norfolk & West. R., Va., Coe, discuss., insets *Am C E* * v 27 -**92**

SCREENING and washing, Commentry, France *E & Min* * July 27, *Genie Civil*; gyrating screen, Coxe & Salmon *E & Min* * Sep 21-**89**

Coal, SEAMS formation, Gresley *E & Min* * Feb 25-**88**
SHED roof, Burlington, Vt. *E News* * Mar 14-**91**
SOUTHERN coal-fields, review, Phillips *E & Min* Jan 4, 4-**90**
STEAMERS, Australian and eastern mail, Robertson, cor. *The Eng* Nov 2-**88**
STOCKING and reloading, new method, Dodge *Am M E* * v 9, do. *Sc Am Sup* * Mar 3-**88,** *Am Eng;* storing, mod. methods, Milnor *Cassier's* * July -**92** ; trestle, Buffalo, Lehigh Val. R. *R Gaz* * Aug 8-**90**
STONE, in lead blast furnace, Neill *E & Min* July 25, Dwight, Aug 8-**91,** *Am Min*
SURVEYS in Westphalia, cost of, Werneke, abs. *Inst C E* v 92 -**88,** *Mitt Mark* -**88**
TENN. C. Iron & R. Co. Pratt mines, Ramsay, insets *Am Min* * v 19 -**91** ; product, J. Jones, cen. bull. *E & Min* Aug 8-**91**
TEXAS coal-fields, Wertzel *E & Min* Aug 23-**90**
TIPPLE at Dunlow, W. Va., Low *E News* * Nov 3-**92**
TRANSFER, Mt. Carbon Co., Page, inset *Am Min* * v 17 -**89**
UTAH produc., '86, Ashburner *Am Min* v 16-**88**
VIRGINIA, So. West coal-field, Killebrew *E & Min* Jan 19-**89** ; West Va. product, etc., J. Jones, cen. bull. Aug 8-**91**
WASHING plant, Merry colls., inset *Eng* * Feb 13-**91** ; at Zollern, near Dortmund, Ger. Jan 29, and sep. plant * July 2-**92**
WASHINGTON State, measures of, Densnap *E & Min* Aug 29-**91** ; coal-fields, Wood *R & Eng* May -**90**
WASTE Commission, Pa. *F Inst* Oct -**90** ; and remedies *R Gaz* Mar 15-**89**
Coast defence, ed. *Eng* Mar 2-**88,** railroads for, ed. May 15; Fiske's elec. position finder * Nov 27-**91** ; tactics of, Walford *The Eng* Jan 31-**90** ; and harbor, dual nature of *J Mil Ser Inst* May -**92.** See also MILITARY eng.
Coastguard boats for Roumanian Gov't. *The Eng* Nov 2, 2-**88**
Cochrane, John *Inst C E* v 109 -**92**
Coddington, John G. T. *Inst C E* v 104 -**91**
Coghlan, John *Inst C E* v 103 -**91**
Cogswell, William B., por. *E & Min* * Oct 24-**91**
Cohen, Mendes, por. *E News* * June 9-**92**
Coils, metal, friction of, H. Shaw *Sc Am Sup* * Nov 10-**88.** See also SPRINGS
Coins, foreign, values *E & Min* Jan 4-**90,** Jan 10-**91,** *E News* Feb 16, 23-**89.** See also MINT reports

Coke, Richard G. *Inst C E* v 96 -**89**

Cokes, and coals, Western Kentucky, J. H. Allen *Am Min* v 16-**88**; the Bauer ovens *Eng* * June 20-**90**, *The Eng* Jan 20-**88**, *E & Min* * July 19, the Semet-Solvay * Aug 9-**90**; produc. in Pocahontas field, Va., Weeks, Sep 10; Hoffman-Otto oven * Nov 5-**92**; indus., util. of bye-products, Terne *F Inst* * Nov -**91**; manuf. in Connellsville dist., Pa., Siebert *Lehigh Eng J* June -**88**

Cold, and mortality, Richardson *Sc Am Sup* Nov 21-**91**; storage, Velly's, Paris * Aug 30-**90**. See also ICE — REFRIGERATING machines

College graduates, Munroe *Tech Q* Feb -**89**

Colors, a standard of *Eng* * May 29-**91**; spectra of various orders of, Croft, Dec 16-**92**; origin of, Armstrong *Sc Am Sup* May 19-**88**; analysis method, Lovibond * June 7, sensation, Abney * 14; and coloring, Church (full) Sep 6-20-**90**, *J Soc Arts Lond*; photometry, Abney *Sc Am Sup* Feb 27, Mar 5; Lovibond's tintometer, Edridge-Green * 12; sense of color, Rutherford (full) Oct 22, Morton * 29-**92**. See also LIGHT; MINERALS, colors

Colorado, Aspen mt. geol. and mines of, Henach (full) *Am Min* * v 17 -**89**, do. mining district geol., Newberry, v 18 -**90**, do. ore deposits geol., Siver *E & Min* * Mar 17, 24-**88**; Boulder Cty. interesting vein, phenom. Farish *Am Min* * v 19 -**91**; lake in Col. desert *E News* Oct 3-**91**; iron resources of, Chauvenet *Am Min* v 18; Leadville, Iron Hill, geol. and ore-deposits, Blow, insets * v 18-**90**; Red mt. mining dist. bedded ore deposits, Kedzie * v 16 -**88**, hot spring formations in, criticism on Emmons, Comstock v 17 -**89**, do. Ouray Cty. ore deposits, Schwarz v 18 -**90**

Columbia Republic, So. Am., notes on, Randolph *Am Min* v 18 -**90**

Columbus, Christopher, Dunlop *Arena* Oct; monument *Sc Am Sup* * Oct 15-**92**

Columbian exhibition, World's. See EXHIBITIONS, U. S. Columbian

Columns, *Am C E* iron, expts., Strobel, insets * v 18 -**88**, do. *E Rec* Dec 3-**87**; Bess. steel bridge compression members, expts. on strength of, Dagron, insets *Am C E* * v 20 -**89**; strength, new formula, Du Bois, discuss., inset * v 27 -**92**

E News strength, formulas, Johnson, Dec 22-**88**; high un-

Columns
braced wrt. iron, Edison station, N. Y. city * May 30-**91**; sections, cor. * Jan 9; for heavy buildings, Deforth * 30; the Larimer steel * July 28-**92**; yellow pine posts, new formula, proposed, Stanwood *Tech Q* Apr -**92**

Combustion, notes on, Chomienne *R & Eng* Aug — Dec -**91**, Jan, Feb -**92**; of hydrogen and atomic wt. of oxygen, Keiser *Sc Am Sup* * Aug 18-**88**. See also FUEL; FURNACES

Commerce, internat. growth and Chic. exhib., ed. *Eng* Nov 4-**92**; commercial points of world, distance between, table *Lehigh Eng J* Feb -**89**; evolution of, Hubbard *Sc Am Sup* May 21-**92**

Companies, corporate organization, Hall *El Eng* Sep 17, Oct 22; *El Rev* Sep 20-**90**; English joint stock, formation of *E & Min* Aug 17-**89**; promoters, trustee, obligations of (mining), Dunderberg case, Nov 1-**90**; public and state treatment of corporations, *Scribner's*

Compass, French pocket-compass, Bergier *Am Min* * v 18 -**90**, *E & Min* * Sep 14-**89**; hist., theoret. and practical, Wilson-Barker *Sc Am Sup* June 18-**92**

Composing machinery. See TYPE setting and composing machines

Compressed air. See AIR, compressed; STREET railroads, compressed air mo. power

Comptograph, Felt's *Eng* * Dec 25-**91**

Concentrators, multiple 'effet,' Hudson *Sc Am Sup* * Aug 9-**90**, *The Eng*

Conclusions, the uncertainty of, Mendenhall *Sc Am Sup* Aug 6 -**92**, *Science*

Concrete, beton, tensile strength, tests *E News* May 17; Carlin's mixer * July 5-**90**; notes on, Newman, bk., Spon, Lond. and N. Y., 1887 *The Eng* July 13-**88**. See also CEMENTS, mortars and concretes

Condensers, surface, Whitham *Am M E* v 9 -**88**; vapor, aut. reg. of injection water, McBride * v 12 -**91**; independent condenser, Conover *Cassier's* * June; and surface do. in Germany, Heinrich *Pwr* * Aug, and feed water heaters, do. * Oct; condensing water, continuous use * Dec -**92**; condensing water extraction ap. *Sc Am Sup* * Aug 18-**88**. See also ENGINES, compound condensing; MARINE engines

Conder, Francis R. *Inst C E* v 100 -**90**

Conduit scrubbing machine, Boston water-works *E News* * June 9-**92**

Conicograph (instrument), R. Harris *Sc Am Sup* * Mar 8-**90**

Conic sections, MacCord *Sc Am Sup* * May 23-**91**, do., Roberval's method of drawing tangents * Nov 5-**92**

Connecting rods and couplers, force of inertia, Klein *F Inst* * Sep * Oct -**91**. See also ENGINES — LOCOMOTIVES, conn. rods

Connor, Augustus S. W. *Inst C E* v 95 -**89**

Conquest, Alexander W *Inst C E* v 110 -**92**

Consular and diplomatic reports, various countries, *The Eng* files -**88**-**92**

Consumption (disease), Mays *Sc Am Sup* Apr 7-**88**

Contracts, unreasonable, ed. *Eng* Aug 19; contractor's bids, rights of lowest bidder, law, Hellier, L. Allen *E Mag* Jan -**92**

Controversy, the ethics of, Fishin *Scribner's* Jan -**89**

Conveyor, antifriction spiral *The Eng* * May 3-**89**

Coode, John *Am M E* v 13 -**92**, *Eng* Mar 4-**92**

Cook, George H., Smock *Am Min* v 18 -**90**, por. *E & Min* * Oct 5 *E News* Oct 5-**89**

Cookery for workingmen's wives, Underwood, report (full) *Sc Am Sup* Jan 4-25-**90**

Copper, *Am Min* hydrometallurgy of, notes, Sterry Hunt v 16 -**88**; assay, electrolytic, Glenn; deposits origin, cop. basin, Ariz., Blake * v 17, 17 -**89**; cop. glance occurrence north of L. Huron and structure of locality, Ives * v 18 -**90**; U. S. resources, Douglass * v 19 -**91**

El Eng produc. and price, Wells, Dec -**89**; electrolytic refining, Gore, Nov 19-**90**; extraction, Hoepfuer's electrolytic proc. Dec 2-**91**; electrol. refining, Badt, June 15-**92**

El Rev Lond voltameter, Anderson * Oct 19; contracts, Nov 2-**88**; Elmore's Co. May 24, June 14-**89**; annealing, Cummins, Sep 5; electro-dep., Fitz Gerald, Dec 5-**90**; Elmore's French electro-dep. Co. Jan 16, ed. 30, 30, Feb 6, Apr 17, 24-**91**, report, Jan 1, 1, report, Apr 22, 29; tempered, Oct 28; Elmore Co's, report, Dec 30, 30-**92**

El Rev tempered, tests, Eureka Co. Dec 27-**90**; electrolytic refining, Badt (full) July 9-**92**

El Wld sulphate, electrolysis in standardizing elec. instruments, Meikle * May 5-**88**; electrolytic refining, Gore, Nov 22-**90**; U. S. produc. Jan 17-**91**; electrolytic refining, notes, Badt (full) June 25; electro-metallurgy of, Cazin * Sep 10, 17-**92**

Copper

Eng extraction proc. June 22; smelting, Am. methods, Westmoreland, cor. Aug 10; Elmore depositing proc., ed. Nov 23-**88**; syndicate, Paris, ed. Mar 15-**89**; Calumet & Hecla mines and Tamarack, Aug 29; L. Superior mines * Nov 7-**90**; smelting, basic linings in, Jan 16; Elmore's depositing proc. 30 -**91**; region of Mich., Phelps, insets *E Mag* * Oct -**92**

E & Min Quincy and Osceola mining Co. report, Mar 31; Tamarack mine, Mich., report (full) * Sep 15; crisis, Lawson, pph. review, 15; Cal. & Hecla, profits of a great mine, 15; copnickel, Sudbury mines, Peters, 22; syndicate contract, Nov 3, 24; United and Champion mines, New Zeal., Henrich * 17; Hampe's method of det. Cu_2O, Dewey, Dec 1, correction, 8; Elmore electro-deposition for wire bars, 8-**88**, tube making proc. May 1-**86**, Aug 18-**88**, Aug 20-**90** * Mar 21, 21, Watt, cor. Apr 18-**91**; U. S. produc. '87 (full) Jan 7-**88**, review (full) Jan 12, Feb 16, Apr 7, 21, July 28; '88, Lewis report, Feb 2; Atlan. mines reports, Mar 23, corner, 23; Quincy mining Co. report, Apr 13, Santa Fé, San Pedro mines, N. M., Raunheim * 13; Ariz. indus., Trippel, May 11; es. of by potassic cyanide, Brugman, 18; corner, relation between Comptoir D'Escompte and Soc. des Metaux, 25; Rio Tinto Co. report, 25, stats. July 13; electrolytic det. by storage bat., Ferguson * Aug 24; Tamarack mining Co., Mich., report * Sep 28-**89**

E & Min indus. and market, '89 (full) Jan 4, 4; U. S., Lond. mines produc. and consumption, 25; Quincy mining Co. report, Mar 1; Coxheath mines, Cape Breton, N. S. * Apr 19; annealing, Cummins, Aug 23; mining district of Mich. and its industries (Cal. & Hec., etc.) * Sep 27: indus. of Houghton Cty, Oct 4; Tamarack mining Co. report, 11, cor. 25; matte smelting, discuss., Lang, Aug 2, Nov 15; Boston & Mont. Consol. Cop. & Sil. mining Co. report, Nov 29; cupriferous pyrites treatment at Huelva, Spain, Launay, Dec 27-**90**, *An Mines* v 16

E & Min produc. '90 (full) Jan 3, '89, Kirchoff, Oct 3; Atlan. mining Co. report, Mar 21; Allouez mining Co. report, 28; produc. '90 and supplies of world, Apr 18; Elmore dep. proc., Peck, cor. June 20; matte smelting in reverb. furnaces, Bettel, July 18, *Chem News* June 26; matte, Manlies' converter for, May 23 * Sep 12; Coxheath mines, Cape Breton, N. S. Oct 10; smelting, mod. Am. methods, Peters, bk. review, Dec 5, do. lit. of, Lang, 26-**91**

Copper

E & Min market '91, stats. (full) Jan 2; smelting reverb. furnaces, es. of labor and material on, Peters * 16; cop. mining profits, ed. 23; cost of producing, ed. Feb 6; extraction, Siemen's electrolytic proc. * Mar 19; and spelter, world's produc. 19; Hoepfuer's electrolytic proc., Eilers * Apr 30; trade understanding, stats., ed. July 23; Asbio mines. Japan, Menzies, Aug 6; electrolytic refining, notes, Badt, 6; and silver, Boston & Mont. report, abs. Nov 19-**92**

E News production of world, 1879-'88, Feb 2-**89**; manuf. by electro-dep., Elmore's Oct 18-**90**, Feb 14, 21-**91**; tempered, Eureka Co's product, com. report *F Inst* Dec -**90**; ores, electrolytic methods of reducing, Masson, abs. *Inst C E* v 108 -**92**, *Rev Mines* v 17 -**92**; produc. of world *R & Eng* July -**91**

Sc Am Sup Elmore proc. July 27-**89**, *Electrician;* electrolytic refining, working of, Gore, *Sc Am Sup* June 13; resources of U. S., Douglass (full) Aug 1-**91**; Hoepfuer's electrolytic proc., Eilers * June 4-**92**

The Eng anal. of * Jan 17, 24-**90**; smelting, basic proc. as applied to, Jan 9; Elmore dep. proc. (machine) * Mar 6-**91**. See also METALS

Coral reefs and islands, Murray (full) *Sc Am Sup* June 15-**89**

Corliss, George H., por. *Pwr* * Mar, *The Eng* Mar 23-**88**

Corry, Alfred J. *Inst C E* v 110 -**92**

Cotton, culture in central Asia, Kittredge * *Soc Arts Mass* -**89**; fibre, Pray *F Inst* * Oct -**89**; mills, elec. power transmission for, Woodbury *El Rev* Nov 12-**92**; the Sun mill, Bombay *The Eng* * Apr 3, 3-**91**; spinning mule, hist., Stadler *Sc Am Sup* * Jan 17-**91**

Cotton-seed oil, industrial applics. of, Grimshaw *F Inst* Mar -**89**. See also OILS, cotton-seed

Counter, Snelgrove's *Eng* * Nov 21-**90**

Counting ap., Hollerith's elec., counting a nation by electricity (full) *El Eng* * Nov 11-**91**, (full) *El Rev* * Jan 26-**89**, Martin *Tech Q* Apr -**92**. See also CENSUS counting

Cowles, Eugene H., por. *E & Min* * May 14, *F Inst* May, por. *Sc Am Sup* * Sep 10-**92**

Cox, Samuel F. *Inst C E* v 92 -**88**

Coxe, Eckley B., Kent, por. *Cassier's* * Dec -**92**, por. *E & Min* * June 27-**91**

Coxon, Samuel B. *Inst C E* v 92 -**88**

Coy, Joseph P. *Inst C E* v 110 -**92**

Crampton, Thomas R., ed. *Eng* Apr 27, *Inst C E* v 94 -**88**, *Inst M E* July, *The Eng* Apr 27-**88**

Cranes and derricks, *Am C E* travelling, componential trusses for Seaman, insets * v 23 -**90**; *Am M E* crane chains, experiences with, Dutton * v 11 -**90**; hydr. trav., Graves * v 12-**91**; trav. overhead elec., performance, Victorin * v 13 -**92**, *El Wld* Dec 10, *Iron Age* Dec 8; Am., Suplee *Cassier's* * Apr * May; trav. elec., Leonard's control system *El Eng* * Dec 14-**92**

Eng 12-ton steam Goliath, inset * Jan 3; 10-ton locom. steam * July 6; electrically worked, Anderson, Sep 14; 25-ton steam, Prince's Quay, Belfast har. * Nov 9; 20-ton overhead trav., Russell's * Dec 14-**88**; Whitaker's steam navvy * Apr 26; Paris exhib. * Sep 13-**89**; 100-ton, Belfast * Jan 24; 5-ton overhead trav., Belgium * May 2; 40-ton wharf * Sep 5; dredging and grab, the Cockburn * Oct 3; 100-ton trav., Fairfield boiler works * 24-**90**; 50-ton steam, Fairbairn * June 5; locom. steam * 19; derrick, stresses in, Elliott * July 10; 25-ton trav., Carron foundry * Sep 4-**91**; Morgan's and lifting appliances * May 27-**92**

E & Min hydr. trav., Graves * Feb 7-**91**; *E News* hydr. charging, inset, Feb 7; derrick plant for Equit. building, Denver, Col. * Aug 22; the Crosby wrt. iron tubular * Nov 28-**91**; Titan, at Leixoes, Portugal * June 30-**92**; 6-ton trav., for elevated road erection *E Rec* * Dec 17-**87**

R Gas trav. and portable drills, etc., So. R. of France * Jan 13-**88**; 110-ton trav., Morgan engine works (full) * June 20; hydr. trav., Graves, Nov 21-**90**; pneu. * June 12; Ridgeway balanced steam hydr. * July 31; rope driven high speed * July 10; for railroad uses, Clements * Aug 14-28-**91**; 100-ton elec., Baldwin locom works, Bates, inset * Jan 29; trav. elec., Shaw * Mar 25-**92**; 10-ton trav. elec., Paris exhib. *Sc Am Sup* * Sep 21-**89**

The Eng 50-ton steam, Firming steel works, Feb 3; 150-ton trav., Abouchoff steel works, St. Petersburg, Feb 17, 17; 15-ton derrick, Butter Bros. Mar 2; 12-ton hydr. wharf, 30; 25-ton Fairbairn wharf, Apr 6; 3-ton locom. steam, Spanish R's, 6; trav., fly rope, 20; 10-ton breakdown trav., Indian State R. June 1, 1; 25-ton trav., Penn. R. July 6, 13, 13; 25-ton portable steam, New Zealand Gov't. R's, 27; 20-ton trav. elec., working of, Anderson, Sep 14; block setting Hercules, Douglass harbor

Cranes
works, Dec 14–**88**; 25-ton trav., Deptford elec. light station, Aug 23; 10-ton trav. elec., Paris exhib. 30; Guyenet system. Sep 6–**89**; crane posts, stresses in, cor. * Aug 29–**90** * Feb 13 –**91**; str., twin screw pontoon, Buarque de Macedo * Jan 1 –**92**. See also DERRICKS

Crank, crank pins securing, method of inserting, Collins *Am M E* * v 9 –**88**; a suggested new form of, Palmer, cor. *E News* * Sep 6–**90**; transmission expts. *Pwr* * Sep –**89**; the Edwards *Sc Am Sup* * Apr 14–**88**; cranks set on an angle * Oct 17–**91**

Cream separator, the Alexandra centrif. *Eng* * May 1–**91**

Cremation, prog. of, Cobb *E Mag* * July –**92**; Jenner *Sc Am Sup* July 28–**88**; of the dead, W. Clarke, May 3–**90**

Crematory furnace, Key's *Eng* * Mar 15–**89**; the Manchester crematorium (dead bodies disposal) * July 31–**91**; crematory at Zurich, Geiser, abs. *Inst C E* v 99 –**90**, *Schweiz Bauz* * v 14 –**89**

Criminology researches, Aaron *Sc Am Sup* June 18–**92**

Crookes, William, por. *El Wld* * Feb 7–**91**, por. *Sc Am Sup* * Apr 21–**88**, por. * Mar 7, 7–**91**, *Electrician*

Crosby, Oscar T., por. *El Wld* * May 31–**90**

Crosland, William M. *Inst C E* v 99 –**90**

Cross, Charles R., por. *El Wld* * Jan 3–**91**

Crossties, Railroad, life *E Mag* Apr –**91**; in France *E News* Dec 14–**89**; consumption of forest supplies by railroads, Tratman, table, Aug 30–**90**; preserving methods, Reed, Sep 20–**90**, Sep 19–**91**; consumption, France, Mathieu, abs. *Inst C E* v 98 –**89**, *Rev Chemins* July –**89**; treatment, Austrian R's, Karplus *R & Eng* Dec –**88**, *Vienna Zeit Eisen*; ties in India *R Gaz* Aug 23–**89**

METALLIC (full) *E & Min* * Dec 29–**88**; steel, N. Y. elevated R's * Mar 2; Aiken's hydr. machine * Nov 2–**89**; ed. Feb 7–**91**; steel * Aug 13–**92**

E News steel, maintenance expenses on, Post, June 30–**88**; some Am. June 29; the Flower-Heller * July 27; Z-iron, Belgium * Sep 7, report, 7; Mar 16, May 11, Nov 23–**89**; report, Aug 30–**90**; 'standard' steel * Feb 7; Servis, Apr 4; Belgian, July 18; Sandburg, Aug 22–**91**; Hartford steel tie and 100-lb rail, N. Y. Cen. R. * Mar 12–**92**

Inst C E metal sleepers, economic value, Hohenegger, abs. v 91 –**88**, *Org Forts Eisen* –**87**; value of pickling, Ribar

Crossties, METALLIC
Inst C E v 91 -**88,** *Zeit Ost* Ing -**87**; steel, manuf., inseparable clip type, Bamber *Inst C E* * v 108 -**92**; France *R & Eng* * June; Mayer * Oct -**89**; Europe * May -**90**
R Gaz Hartford steel * Dec 7-**88**; elastic tie plate, Sandberg's * Mar 8 * Apr 5-**89**; Penn. experimental * June 6: the Bonzano steel * Oct 17-**90**; Indian R's; June 5-**91**; Reece * Feb 19; N. Y. Cen. steel * July 22, manuf. of, Bamber * 22; Heindl steel, reports of use, Dec 23-**92**
Sc Am Sup * May 30-**90**; Hartford steel * Feb 9-**89**, *R Rev;* Indian State R. steel sleepers *The Eng* Nov 30-**88**; Cabry do., No. E. R. * Jan 4-**89**

Crowe, William M. *Inst C E* v 93 -**88**

Crowds, weight of *E Rec* Dec 24-**92**

Crushing and amalgam. mill, the Crawford *E & Min* * July 23-**92.** See also DISINTEGRATORS

Cryolite mine, Greenland *Sc Am Sup* Mar 14-**91**

Crystallization, Liveing *Sc Am Sup* * July 25-**91,** *Am J Sci;* crystals *Locom* Mar -**92**

Cuba, business opportunities, Chibas, insets *E Mag* * Nov -**92**; Havana, St. Jago trade in '87 *The Eng* Aug 3-**88**

Culvert, Harlem arch *E News* * Apr 26-**90.** See also RAILROADS, culverts

Cundy, John *Inst C E* v 109 -**92**

Cupola furnaces. See BLAST furnaces; FOUNDRIES

Curran, Henry B., por. *E & Min* * Dec 27-**90**

Current meter observations, Miss. river, report *F Inst* Apr -**88**

Curve ranger, Trotter's *Sc Am Sup* * Jan 11-**90** * Dec 12-**91,** *Eng, The Eng.* See also INSTRUMENTS; SURVEYING

Curves, the false ellipse, Wurtele *Am C E* * v 24 -**91**; the logarithmic, practical uses, Cox *E News* * Aug 29-**91**; radii of curvature geometrically determined, MacCord (full) *Sc Am Sup* * Jan 5-19 * June 22 * July 13 * Aug 3-**89** * Jan 11 * Oct 18-**90,** geomet. considered * Dec 10-**92,** instruments for drawing * Dec 28-**89** * Mar 29 * July 12 * Sep 20-**90** * Apr 4-**91** * May 14-**92**

Cyclones, whirlwinds *Sc Am Sup* * Aug 11-**88,** *La Nature.* See also STORMS; WIND

Cyclostyle duplicating ap., com. report *F Inst* Apr -**88**

Dady, Jamsetjee N. *Inst C E* v 92 -**88**

Daft, Leo, por. *El Wld* * Mar 30-**89**

Dakota, Black Hills, ore deposits, Carpenter (full) *Am Min* * v 17 -**89**

Dams, or high walls to resist the pressure of water, Francis, discuss., insets *Am C E* * v 19 -**88**

E News great, of world, inset * Jan 7, 7; high masonry, theory of, Church, report * 14, do., Fteley, Feb 4, 11, det. of profile, Morley * Aug 11, Francis, an error of theory, ed. * Nov 17, earthern, how to build * 17, sluice gates * 24, strains in, Flagg, cor. * Dec 8, curved, Church * 22-**88**; and reservoirs, state supervision of, ed. Aug 24, 24-**89**; earthern vs. masonry, Follett, Jan 2, 9; flow of thick sheets of water over, Herschel * Nov 10-**92**

E Rec hillsides protection, Mahan * Dec 6-**90**; earth and masonry for irrig. works, Follett, May 14, 28; back water from, July 9; design of retaining walls, K. Allen, Nov 12 * 19-**92**

F Inst compound dikes (stone), most econom. cross-section, d'Auria * June -**88**; notable (Irrig. in India), Barois, *R & Eng* * Dec -**92**; masonry, design and construction, Wegmann, bk. *The Eng* Oct 26-**88**; dangerous, Sep 13-**89**. See also CANALS; EARTHWORK; HARBOR eng; HOLLAND dikes; IRRIGATION, India; RIVERS; RESERVOIRS; WATER-works

ATHENS, Ga., Ledlie *E News* * May 5-**88**

AUSTIN, Texas, Col. river *E News* * July 11-**91**; Fanning, report, Frizell * Sep 29-**92**

BEAR Valley, Cal. See DAMS, Sweetwater

BEETALOO water-works, So. Australia, concrete *Eng* * July 3-**91**; Moncrieff *E News* * May 30 * Sep 19-**91**; *R & Eng* * July -**91**; *The Eng* * May 8-**91**

BETHEL, Ct., water-works, and filter bed, proposed *E News* * Mar 7-**91**

BHATGARH *R & Eng* * Aug -**92**

BLACK Eagle Falls, Great Falls, Mont., Parker, discuss., insets *Am C E* * v 27 -**92**; *E Rec* * Oct 8-**92**

BOIRE river *E News* * Apr 26-**90**

BUTTE City water-works, concrete masonry *E News* * Dec 15, 22 -**92**

CAMBRIDGE water-works, Mass., Stony Brook, Barbour *E Rec* * Jan 5-**89**

CASTLEWOOD, Denver Water Storage Co. *E News* * Mar 22 -**90**

Dams, COFFER-dams and floating caissons, R. Hunt *E & Min* * July 19, 26-**90**
CONEMAUGH, Johnstown, Pa. *The Eng* * June 21-**89**, *E Rec*
CROTON water-works, N. Y., Convent ave. gate-house *E News* * Sep 1, 15-**88**; inset * Nov 15, 15-**90**; inset * June 2-**92**; Fteley report *E Rec* * Oct 18-**90**. See also DAMS, Quaker bridge, Sodom
CURVED vs. straight, Bell *E News* Mar 31; strains in, Church, cor. * Dec 1, cor. * 28-**88**; cor. Aug 16; masonry, strains in, Martin, cor. Sep 27-**90**
DAVIS Is. movable, Ohio river, Pitts., Pa. *Sc Am Sup* * Aug 1-**91**
DENVER, Col., Citizen's water Co., large, n *E News* Sep 20-**90**. See also DAMS, Castlewood
ENGLISH, Sierra Co., Cal., destroyed *E News* * July 6-**89**
FOLSOM, Am. river, Cal. *E News* * Oct 17-**91**, *R & Eng* * July -**92**
HOLYOKE, Mass., Whiting st. *E News* * Sep 6-**90**
KINGSTON'S floating scouring *Eng* * Oct 26-**88**
KIRK wooden *E News* * Apr 28-**92**
LAWRENCE, Merrimac river, Hale *E Rec* * May 4-**89**, *J Assoc E Socs*
LUMBER, Penn., inset *E News* * Sep 5-**91**
MOVABLE, Pochet's (full) *Sc Am Sup* * May 24-**90**, *Genie Civil.* See also DAMS, Davis Is.
MUSKINGUM river *E Rec* * Mar 8-**90**
NEW Brunswick water-works, a dubious, Hill, cor. *E News* * June 16, proposed * 23-**88**
NILE barrage *E News* Sep 27-**90**
NORTHFIELD, Vt., a very bold arch *E News* * Sep 20-**90**
PAWTUCKET water-works, R. I. *E News* * June 1-**89**
PECOS river, N. M., rock fill *E News* * May 17-**90**. See also DAMS, reservoir
PERIYAR, Madras *Eng* * Nov 25, inset * Dec 9, construction *E Rec* * Dec 31-**92**
POTOMAC river, Wash. water-works, constructing, Chittenden, inset *Am C E* * v 18 -**88**
QUAKER bridge, Croton aqueduct, N. Y. water-works *E News* * Feb 4, table, 11, design of, ed. 25, Marichal, cor. Mar 10; report and ed., inset * Nov 3, 3-**88**; Fteley, Oct 11-**90**; map *E Rec* * Oct 6; report *R Gaz* * Oct 12, 26; Tratman *The Eng* Jan 27, Apr 20, Nov 30-**88**. See also DAMS, Croton

Dams, RESERVOIR, safety of, Kresnik *E & Min* * Mar 1-**90,** *Inst C E;* rock fill, ed. *E News* July 28, Aug 11, and Schuyler, cor. Sep 22-**88**; and Conn. law, ed. Aug 24-**89**; European, Kresnik, Mar 15; Apr 12; measures for safety of, do. May 10; and embankments for water-works, inset * June 21-**90.** See also RESERVOIRS; WATER-works

SODOM, Croton, N. Y. water-works, n *E News* * Dec 1-**88**; Oct 25-**90**; *Sc Am Sup* * Jan 5-**89**

SOUTH Fork reservoir failure, cause, com. report, discuss. (very full), insets *Am C E* * v 24 -**91**; *Eng* * June 7-**89**; and Johnstown disaster *E News* * June 15-**89**; com. report *E Rec* * Aug 29 * Sep 5-19-**91**

SWEETWATER, San Diego Bay, construction, Schuyler, discuss., insets *Am C E* * v 19 -**88**; and Bear Valley, do. *E News* * Apr 7, F. Brown (Redlands, Cal.) * June 23, Schuyler * Oct 27-**88**; Nov 23, 30-**89**; Schuyler, abs. *Inst C E* v 97-**89**

TANSA, Bombay water-works, inset *Eng* * Apr 29; *E News* * June 30-**92**; *E Rec* * Dec 19-**91**

VYRNWY lake masonry, Liverpool water-works *E News* Dec 29-**88**; and ed. * Aug 18-**92**; *R & Eng* * Jan -**89,** *Industries; The Eng* * June 27-**90**

WALNUT Grove, Ariz., disaster *E & Min* * Mar 1-**90**; *E News* Sep 22 * Oct 20, Nov 3-**88**; * Mar 8-**90**

WATER-works, of U. S., (list) *E News* June 15-**89.** See also RESERVOIRS; WATER-works

WESTPHALIA, Verse river, proposed, inset *The Eng* * Feb 1, 8 -**89**

Daniel, John, por. *E & Min* * Feb 28-**91**

Davenport, Thomas, (inventor elec. motor), Pope, por. *El Eng* Jan 7; some cor. *El Wld* Apr 25; *St R J* * Apr -**91**

Davidson, Robert, por. *El Wld* * June 20-**91**

Davy, Humphrey *Eng* Jan 8-22, Feb 12-**92**

Day, David T., por. *E & Min* * May 23-**91**

Death, Mitchell *Sc Am Sup* Oct 15-**92,** *Nat Sci;* origin of, Gardiner *Tech Q* July -**91**

Dean, John, por. *E & Min* * Dec 20-**90**

Debts, county, of U. S., diagram *E News* * Sep 6-**90**

De Camp, Edward F., por. *E & Min* * Sep 12-**91**

Decorticating machinery *The Eng* * Dec 27-**89**

De Lamar, J. R., por. *E & Min* * Sep 5-**91**

Delta metal, *E News* July 26-**90**

Denham, Henry M. *Inst C E* v 91 -**88**
Denny, Robert *Inst C E* v 95 -**89**
Denny, William (ship builder) bk. n *Eng* Jan 25-**89**
Dentistry, mechanics of, Sweet *Cassier's* Nov -**92**
Deserts, Am. Sahara, 'Valley of Death' *Locom* Jan -**91**; great, of the earth, James (full) *Sc Am Sup* June 22-**89**
Derricks, hydr. and steam, Brown Bros. *Eng* * Apr 18-**90**; stresses in, Elliott * July 10-**91**; hydr. hoist, H. M. S. Vulcan * Nov 18-**92**; derrick plant for Equit. building, Denver, Col. *E News* * Aug 22-**91**; 15-ton. Butter Bros. *The Eng* Mar 2-**88.** See also CRANES
Devonshire, Duke of (W. Cavendish) *Inst C E* v 107 -**92**
Diamond mining and industry, etc., polishing *Eng* * Feb 8-**89**; washing machinery * Apr 25-**90**; Kimberley stats., So. Africa, Sep 4-**91,** report Dec 23-**92,** do., Stonestreet *E Mag* * Aug -**91,** do. *E & Min* Sep 19, discov., Thorburn, Oct 24-**91**; Kimberley indus., Churchill, *Pop Sci* * Aug -**92**; mines, Africa *Sc Am Sup* * Aug 22-**91**; the De Beers mine *The Eng* Aug 17-**88.** See also GEMS
Dibblee, Frederick L. *Inst C E* v 97 -**89**
Dick, Charles *Inst C E* v 94 -**88**
Dickinson, George C. *Am C E* v 26 -**92**
Dictionary. See CENTURY dictionary
Diet, proper, for hot weather, Davies *Pop Sci* July -**92**
Dikes, Holland, notes, Starling, discuss., map, insets (very full) *Am C E* * v 26-**92,** do. *R Gaz* Nov 11-**92**; compound (stone), most economical cross-section of, d'Auria *F Inst* * June -**88.** See also CANALS; DAMS; RESERVOIRS; RIVERS, etc.
Dirks, Justus *Inst C E* v 92 -**88**
Disasters, in Aug., ed. *E News* Sep 8-**88**; great, earthquakes, floods, etc., ed. July 6-**89.** See also BRIDGE accidents; BOILER explosions; FLOODS; STEAMERS; RAILROADS, accidents, etc.
Discoveries, great, of past sixty years *Locom* Sep-Nov -**89**
Disinfecting ap., Koch, abs. *Inst C E* v 96 -**89,** * *Bul Soc Mul* -**88**; *Sc Am Sup* * June 30-**88,** *The Eng*
Disintegrator, the devil *Eng* * Aug 10-**88**; trials *The Eng* * June 27-**90.** See also CRUSHING, GRINDING
Disk, hollow cast iron, strains in, Leverich *Am C E* * v 18-**88**
Dividing engine, 40,000 lines to the inch, Rowland *E News* Feb 18-**88**

Diving boats *Eng* Mar 15, Apr 5-**89**; Stove's diving dress * Mar 28-**90**

Dixon, John *Eng* Feb 6-**91**, *Inst C E* v 104 -**91**

Docks, Auckland, N. Z., calliope graving, Swainson *Inst C E* v 101 -**90**

BARRY, works, J. Robinson *Eng* Apr 11-**90**, hydr. machinery and mode of tipping coal, discuss., insets *Inst C E* * v 101 -**90**

BOMBAY graving, proposed *Eng* * May 18-**88**

BRISTOL *The Eng* * Oct 14-**92**

BROADSIDE dock slip, for ships *Sc Am Sup* * Aug 8-**91**

BROOKLYN Navy Yard dry-dock, Simpson *Eng* * Aug 22, *R & Eng* June -**90**

CARDIFF schemes, Bute dock, map *The Eng* * Dec 9-**92**

CHATHAM *The Eng* * July 24-**91**

CUBA, crib for Signa Iron Co. *E News* * Apr 9-**92**

DRY-docks, of world *R & Eng* Aug -**89**; Wivenhoe *The Eng* * Feb 21-**90**. See also DOCKS, names of places

ESQUIMALT, Brit. Columbia, inset *Eng* * July 20, inset * 27-**88**

FLOATING, and pontoon, Taylor *Eng* * Aug 10, do. *Sc Am Sup* * July 7-**88**; offshore, Hamburg * May 10-**89**, do. *The Eng* * Mar 11-**92**; Limerick, steel gates, Hall *E Rec* Apr 10-**90**, do. *Inst C E* v 97 -**89**

GLASGOW harbor *Eng* * Aug 9-**89**; the Cessnock *E News* June 2-**92**

GRAVING *Eng* Nov 18-**92**, *Inst C E*. See also DOCKS, names of places

HALIFAX, Nova Scotia, graving *The Eng* * Feb 28-**90**

HAMBURG floating offshore *Eng* * May 10-**89**, *The Eng* * Mar 11-**92**

HAVRE port dry-dock *E Rec* * Dec 3-**87**, * *Genie Civil;* Bellot dock, Desprez, abs. *Inst C E* v 101 -**90**, *An Ponts* * v 17-**89**

HULL, Alexandra, Hurtzig *Eng* Feb 10, discuss., inset *Inst C E* * v 92 -**88**

INDIA, East & West, arbitration *Eng* Dec 28-**88**

LEAGUE Island dry-dock *E News* * Mar 14-**91**

LIMERICK, floating, gates, Hall *E Rec* Apr 10-**90**, *Inst C E* v 97 -**89**; failure of walls and methods for reconstruction, Hall, inset * 103-**91**

LIVERPOOL, port and Mersey river, dredging *Eng* * May 30 * June 6; Lyster, Jan 17, extensions, discuss., insets (very full) *Inst C E* * v 100 -**90**; Mersey estate *Inst M E* July -**91**

Docks, MARE Island, Cal., dry-dock *E Rec* * Feb 13-**92**
MARQUETTE, Mich., ore dock, Duluth, So. Shore & Atlan. R. *E & Min* * Jan 10-24-**91**
NEW York dock walls *E Rec* * Sep 3, Oct 1-**92**
PORTSMOUTH dockyard *Eng* July 29 * Aug 5, 5, lifting ap., Corner, 26-**92**
PRESTON scheme, ed. *The Eng* June 29-**88**
PUGET Sound, Wash., U. S. Naval station, inset *E News* May 19-**92**
SAN Francisco dry-dock, hydr., Union Iron works *R Gaz* * Nov 27-**91**
SOUTHAMPTON tidal *Eng* * Sep 12, inset *The Eng* * July 25 -**90**
Domestic motive power by atmos. exhaustion, Dollfus, abs. *Inst C E* v 93 -**88**, *Bul Soc Mul* -**88**; motors worked by rarefied air, Bourdenoot, abs. v 96-**89**, *Compt r* Feb 1-**89**
Dolivo-Dobrowolsky, Michael Von, por. *El Wld* * Mar 19-**92**
Dom Pedro, ex-Emperor of Brazil *Inst C E* v 108 -**92**
Douglass, Archibald Bryce - *The Eng* Apr 10-**91**
Dovetails, holding power of, Poe, report *E News* * Dec 20-**90**
Downes, Charles C. *Inst C E* v 92-**88**
Downing, Samuel F. *Inst C E* v 109 -**92**
Drainage, tables, G. Johnson *E News* May 5, 12-**88**; blunders, Webster *E Rec* * Dec 10, 24-**92**; hints, Chandler *Tech Q* Dec -**88**. See also SEWERAGE
CHARLESTON, S. C., tidal *E News* Oct 25-**90**
CHICAGO, drainage canal *E News* * June 2, 30-**92**; *E Rec* May 23-**91**
FENS and lowlands, by gravitation and steam power, Wheeler, bk., Spon, Lond. -**88**
HOUSE, domestic and water supply, Hartford *E Rec* * Apr 2, 16-**92**; Chandler *Sc Am Sup* Jan 26-**89**, *Tech Q*
LOUGH Erne, Price, discuss., inset (full) *Inst C E* * v 101 -**90**
KANKAKEE marsh, Chic. canal *E News* * Nov 3, 3-**92**
MEXICO, Valley of, Chism, map *E & Min* * Dec 8, 15, 22-**88**, map *E News* * Aug 10-**89**; City of Mex., hist. sketch, Noll *E Rec* Mar 16-**89**; Val. *Sc Am Sup* * Aug 10, map *The Eng* * June 28-**89**
WIESBADEN-Essen-Halle, abs. *Inst C E* v 96 -**89**, *Deut Vier Ges* -**89**
Draw-bridges. See BRIDGES, draw-bridges

Drawing, section lining, standard, Van Vleck *Am M E* * v 9-**88**; Holman *Cassier's* * Sep -**92**; drawing-board, vertical *Eng* * Jan 13, do. Vorth's *E News* Apr 7-**88**; section-liner and scale divider, Both's * Oct 12-**89**; T square, Deane's adjustable * Sep 13-**90**; essentials of mechanical drawing, Forney (very full) *R & Eng* * Mar - * Dec -**90** * Jan - * Dec -**91** * Jan -**92**; as a means of education, Ablett *Sc Am Sup* July 7-**88**; simple method (artistic), Jacquot * Mar 29-**90**. See also INSTRUMENTS, curve rule

Dredge, James, Wiley, por. *Cassier's* * Feb -**92**

Dredgers and excavators, Panama canal, Williams, insets *Am C E* * v 19-**88**; steam excavs., Clements *Am M E* v 9 -**88**; Bennett elec. and amalgamator *El Rev* * May 23-**91**

Eng double-ladder, Swansea harbor, inset * July 13; frictional gear for, Griffith * Aug 24; 'Kuphus' hopper, Bombay Port, inset * Dec 7-**88**; hopper suction 'Libana,' Port of Libau, inset * Jan 11; shore delivery for lake Copais * Feb 1; dredging cost, Apr 26-**89**; sand pumping, Mersey bar, ed. Apr 11, and docks * May 30 * June 6; Cockburn crane and grab * Oct 3-**90**; for excav. gold-bearing river beds * Jan 9; steam crane excav., Weser river imp. works * 16; dredging and amalgam. plant, inset * Mar 27; Manchester canal soil transporter, inset * July 24-**91**; floating elevator, transformation * Aug 19; Jupiter twin screw suction pump * Sep 30-**92**

E News Panama canal plant * Aug 18, 25; French suction, Vernandon * Nov 10-**88**; English, cost of, May 11; Lobnitz rock * Jan 26, work of * Oct 19-**89**; German stone * Aug 16-**90**; Man. canal soil transporter, Sep 5-**91**; ap. for N. Y. harbor, Edwards, inset * Mar 19; the Booth pump * 26; trestle filling, N. Or. & N. E. R. * Aug 4; dredging on Pac. coast, Miller, 4 * 11-**92**; Lobnitz rock, removal under water without explosives *E Rec* * Oct 12-**89**; four-screw hopper, Walker * Feb 13-**92**, do. inset *Inst C E* * v 107 -**92**; the von Schmidt, Higgins, inset * v 104-**91**; hydr., N. Y. harbor *R Gaz* Aug 28-**91**; Jandin's hydro-pneu, jointed conduit *Sc Am Sup* * Mar 9-**89**

The Eng dredging machinery, subaqueous rock, Suez canal, Mar 9; combined traction engine, crane and excav. 30; hopper, Glasgow exhib. Sep 7, 7-**88**; Wilson's single chain grab * Nov 28-**90**; hopper, for New So. Wales, inset * Apr 8; sand pump, Thyboron, inset * Sep 16-**92**. See also under CANALS; HARBOR eng.

Drexel Institute, Phila., Depew *E Mag* Feb -**92**

Drifting tests, autographic, Goodman *Inst C E* * v 92-**88**

Drills and drilling, electric mining *El Wld* * Dec 12; Simplex twist-drill grinder *Eng* * Nov 6-**91**; Ingersoll-Sergeant, air valve *E News* * Sep 27-**90**; Ainly-Oakes square hole drilling machinery, inset * June 20, inset * 27; Edison elec. percussion, May 16-**91** * Aug 25: Schuttler contin. acting ratchet * Oct 6-**92**; rock, trials, Carbutt, insets (full) *Inst M E* * Mar; Hawksworth stay-bolt *R Gas* * May 29-**91**; Edmeston grinding machinery *The Eng* Apr 27-**88**. See also ROCK drills

Driven wells. See WELLS

Dry-docks. See DOCKS, dry-docks, etc.

Drying ap. in vacuo, Passburg *Eng* * June 28-**89**, insets *Inst M E* * May -**89**, *Sc Am Sup* * Apr 19-**90**

Dublin, port and works, Griffith, insets *Inst M E* * July -**88**

Duluth, Minn., sts., pavements, sewers and drainage *E News* * Feb 14-**91**

Duncan, Louis, por. *El Wld* * Apr 5-**90**

Duncan, Robert *The Eng* July 12-**89**

Duncan, Thomas *Inst C E* v 110-**92**

Du Port (Bey), William J. *Inst C E* v 106-**91**

Duodecimals, Halliday *The Eng* Mar 1-**89**

Dust, (means of excluding) and fresh air, Teale *Pop Sci* June -**92**; number of particles in atmos., Aitken *Sc Am Sup* Apr 7 -**88**; atmospheric, Marcet, June 21-**90**; spectroscopic properties, Liveing * Feb 14-**91**; McPherson, Jan 2-**92**; Prinz dust collector *The Eng* May 11-**88**

Dye-houses, ventilation of *Locom* Dec -**88**

Dyes and dyeing, a revolution in dyeing, Chase *F Inst* Nov, Dec -**90**; and photographic printing, diarotype proc., Carbutt, June -**91**; dyes, coal-tar or aniline *Chem Tr J*, *Sc Am Sup* May 9, fast and fugitive, Hummel (full) July 11, 18-**91**, Jan 30 -**92**, *Soc Arts Lond*; lactic acid and lactates in textile coloring, Norton *Tech Q* Nov -**90**. See also CHEMISTRY; COLORS; INDIGO, etc.

Dyewood extracts, notes, Siebold *Sc Am Sup* Aug 17-**89**

Dynamics, a question of, Dewey, ed. *E News* * June 23-**88**; dynamic possibilities, ed. Sep 15-**92**; practical illustrations of, Greenhill *The Eng* Sep 13, 27 * Oct 25 * Nov 8, 22, Dec 6, 20, 27-**89**, problems in, Jan 31, solution, Apr 4; nomenclature com., Brit. Assoc. pro. Aug 15, 22-**90**; of gravity, Preston, cor.

Dynamics
Apr 10-**91**. See also PHYSICS, Dynamics, bk., Fessenden, Lond. -**92**

Dynamite shells, ed. *Eng* Nov 16-**88**. See also EXPLOSIVES; GUNNERY and armor

Dynamometers, transmitting, loss in by friction, S. Webber *Am M E* * v 10-**89**; aut. absorption, Alden * v 11 -**90**; belt dyn., Watt v 12 -**91**; measurement of power, Gray, variable speed power transmission, Spaulding * v 13, 13 -**92**, *Iron Age* * Dec 8-**92**

Cassier's power measurement, Gray * June -**92**; Alteneck *El Eng* * May -**88**; *El Rev Lond* * Sep 23-**92**; the Trouvé *El Wld* * July 19-**90**; Heinrich * June 11-**92**

Eng friction brake, Beaumont, Nov 16-**88**, do. Brotherhood registering * June 14-**89**; Amsler's recording * Oct 24-**90**; a belt, Watt * Sep 18-**91**

E News aut. absorption, Alden * June 28-**90**; belt dyn., Watt * June 20-**91**; measurement of power, Gray * May 19-**92**; rough and ready, for small motors, Hoskin *F Inst* June **91**; friction brake, Beaumont, discuss. (full) *Inst C E* * v 95-**89**; aut. registering *Sc Am Sup* * Feb 9-**89**, * *Industries*

The Eng Deprez registering, Feb 17; Smith's rotary transmission, May 11; friction brake, Newcastle engine trials, Anderson, Nov 9-**88**; Murray power transmission * Nov 29-**89**

Dynamos, Dynamo-Machinery, S. P. Thompson, bk., Spon, Lond. '88

El Eng machines, theory, Hopkinson * Jan, diseases, S. P. Thompson, Jan -**88**; shunt wound, influence of position of commutation on output of, Martin * Dec 31-**90**; design, Reid * Feb 4, 11-**91**; management, Crocker, Wheeler * Jan 13, 20 * Feb 3-17 * Mar 9, 16, 30, Apr 27 * May 11, 18; design, Loomis, Mar 16; machinery, theoret. elements, Kennelly * Apr 20, 27 * May 4, 18, 25, June 15, Nov 30, Hopkinson * May 11; genesis, Pacinotti, por. * Sep 21, 28 * Oct 5, 12-**92**

El Rev Lond machines, synthetic study (full) * Aug 3, 10, 24, Sep 7, 21 * Oct 5, 19 * Nov 2, 16, 23 * Dec 7, 21-**88** * Jan 11, 25, Feb 15 * Mar 1, 15 * Apr 5, 19 * July 5, 19 * Sep 6 * Oct 4-**89** * Jan 31 * Feb 14 * Apr 4, May 2, 16, June 6 * July 11, Aug 22, Sep 26, Nov 7, Dec 26-**90**; Paris exhib. * July 12, 26 * Aug 2, 9, 23 * Sep 6, 13 * Oct 11-**89**; machines, Minet, Feb 7, 14; and motor design, Esson * 28 * Mar 7, 14-**90**; Blackburn

Dynamos

* Jan 30 * Feb 6; choice of a dynamo, considerations, Roberts, Oct 30, Nov 6; Frankfort exhib. * Oct * Nov * Dec -**91**; machinery, Hopkinson * Apr 15; waste field of, expts., Puffer * 15; relative weights and costs, Snell * May 20; cals. and designing chart, do. * June 3-**92**

El Rev Knowles * July 20-**89**; machines and motors imps., Swinburne * Apr 19; control of and coupling, do. Sep 6, 13-**90**, *Industries*

El Wld and motors, cal. and designing, Crocker * Apr 28; machines construction, Poole, June 30; and motors designing, Owens * Nov 17-**88**; machines, Hillairet, Sep 7-**89**; and motor design, Esson (full) * Mar 22, 29 * Apr 5, 12; best speed, Rechniewski * Sep 13, new forms, Wadsworth * 13-**90**; choice of a dynamo, Roberts, Oct 17-**91**; and motors, magnetic leakage, Ives (full) * Jan 2; effic. determinations, Kapp * Feb 20; dynamo-elec. machinery, Hopkinson, Wilson * Apr 30; relative costs and wts., Hering * 30; and motor cal., Bedell, diag. * 30; heat radiation from, Rechniewski, May 14; relative wts. and cost, Snell * June 25; effic. diag., Hering * Aug 13; designing, Picou, Nov 5-**92**

Eng Paris exhib. * Sep 6; Desrosier, do. * Oct 18-**89**; early * July 10-**91**; and motor cal., Bedell, inset *F Inst* * June -**92**; 1000 h.p. steam, Berlin Cen. elec. light station, Uppenborn, abs. *Inst C E* v 100 -**90**, *Elek Zeit* v 5 -**90**; Cail Soc. abs. *Inst C E* v 106-**91**, * *Genie Civil* v 19 -**91**; designing, Hobart *Pwr* * Oct * Nov -**89** * Feb - * Apr * June - * Sep -**90** * Feb, Mar -**91**; development, Fairchild * Apr * May -**90**; losses in, Hobart * May -**91**; diseases of, S. P. Thompson *Sc Am Sup* Jan 7-**88**; waste field of, experimental study, Puffer *Tech Q* * Oct -**91**; speculations on electro-magnetism, Fritsche *The Eng* * June 21; Alioth, Paris exhib. July 12-**89**. See also ELECTRIC generators — motors

ACCESSORIES, dynamo room, for resist. measurements, etc., Haskins *El Rev Lond* * Sep 6 *El Rev* * Aug 17 *El Wld* * 17-**89**

ADMIRALTY specifications *El Rev* May 3-**90**

AIR gap, relation of, and shape of poles to performance of, Ryan *El Eng* * Sep 30 * Oct 7, (full) *El Rev* * Oct 3, (full) *El Wld* * Oct 3-**91**

ALTERNATING current, arc, analyzing magnetic reactions of armatures, Reid *El Eng* * Nov 5; Stanley arc, Tobey * Nov 5, do.

Dynamos, ALTERNATING
investigation (full) *El Rev* * Nov 8, do. *El Wld* * Nov 8-**90**; Kennedy *El Rev Lond* * June 1-15, 29-**88**; * May 17-**89**; curves showing performance, Lewis *El Wld* * Nov 14-**91**; machinery, Kapp *Eng* Feb 22, May 31-**89**, do. and discuss. (full) *Inst C E* * v 97-**89**; generators and receivers, Anthony *Soc Arts Mass* -**88**

AMPERE-foot table for cal., and motor windings, Serrell *El Eng* Dec 10-**90**

ARC, open coil, M. E. Thompson *El Eng** May 27, (full) *El Rev Lond* * June 19, *El Rev* * June 6, discuss. 13, *El Wld* * May 30-**91**. See also DYNAMOS, alt. current

ARMATURE reactions and motors, theory, Swinburne *El Rev Lond* * Feb 14, 21, discuss. Mar 28, Apr 4, *El Rev* * Mar 15-**90**; ring, relative proportions of, Dobbie *El Wld* * Jan 26; methods to determine equiv. area of, Ferry, Aug 31-**89**; reaction in constant current, Carhart (full) * June 6; reactions, Wagner * Aug 22-**91**, *Technic*

BALL, manuf., Collins *El Eng* * Nov 30-**92**

BROWN'S, transmiss. of power by *Eng* * Apr 20-**88**

BRUSH alt. current system *El Eng* * Aug, *El Rev* * July 13; arc, effic. etc., Melbourne exhib. lighting, Murray *El Rev Lond* Nov 15-29-**89**

COMPOUND winding, theory of for constant poten., Bell *El Eng* Nov 26, *El Rev* * Nov 29-**90**; patents (full) *El Rev Lond* Nov 30, Dec 7-28-**88**, Mar 1-15, May 31, June 7, 14, July 5-**89**, machines, July 25-**90**

CONTINUOUS current machines design, Jamieson (full) *El Rev Lond* * Mar 8-**89**, *Inst C E*

DESROZIER'S disk-dynamo, Meylan, abs. *Inst C E* v 95-**89**, *Lum Elec* v 29-**88**

EVANS friction cone direct driving system (theory) *El Eng** Mar 25-**91**; *El Rev* * Sep 14, belt *El Wld* * Sep 14-**89**

EDISON, and motor *El Rev Lond* * Aug 21-**91**; *Sc Am Sup* * Mar 5-**92**; Paris exhib. *The Eng* * Nov 15-**89**

EICKEMEYER'S *El Eng* * Mar -**88**

FERRANTI system, Haskins *El Rev* Feb 28-**91**; 10,000- light, Grosvenor gallery, Lond. *Sc Am Sup* * Dec 15-**88**; *The Eng* * Nov 1-**89**

FIELD-magnet coils for, Kapp *El Wld* May 3-**90**

FRITSCHE wheel *El Rev* * Apr 6, n *Sc Am Sup* * Apr 20-**89**

Dynamos, GANZ contin. current, Delta type *El Rev Lond* * Dec 14-**88**; alt. machine and transformer, Forbes *El Wld** May 25 -**89**

GOOLDEN-Willans combination, tests *El Wld** Dec 6-**90**, *Electrician Lond*

HOCHHAUSEN arc light machine *El Eng* * Apr 23-**90**

LEAKAGE, magnetic, and motors, Ives *El Rev Lond* * Jan 22, 29 -**92**, *El Wld*

LEEDS, the *The Eng* May 25-**88**

MORDEY alt. current *Eng* * June 1-**88**

MULTIPOLAR, low speed, for contin. currents, Perret *El Eng* * Nov 26, do. *El Rev* * Nov 29, do. *El Wld* * Nov 29; Riker low speed contin. current, and motors * Dec 17-**90**; at Frankfort exhib., Kolben * Nov 25 * Dec 2; design, Esson * May 6, 20, do. *El Rev Lond* * Apr 10, 24, May 1, do. *El Rev* * May 16, do. *El Wld* * May 2, 9, 23-**91**; *Pwr* * Dec -**92**

OERLIKON three phase alt. current *El Rev Lond* * Aug 28-**91**

PERRET, and motors, building (full) *El Eng* * Jan 6-**92**; and motor *El Wld* * Feb 2, July 6 * Aug 3-**89**. See also DYNAMOS, multipolar

PLATING, Hopkin's *Sc Am Sup* * Mar 14-**91**

PYKE & Harris alt. current *El Rev Lond* * May 6, 13-**92**

PYLE aut. steam engine and (multiple cyl.) n *El Wld* * Aug 29 -**91**

REGULATION, arc or constant current, Tischendorfer *El Eng* * July 1-**91**; by means of a third brush, Caldwell (full) * Dec -**88**, (full) *El Rev Lond* Jan 4-**89**; alt. current regulating, Lowrie * Sep 28-**88**; current reg. decision, T. H. vs. Citizen's Elec. L. Co. *El Wld* Sep 1-**88**; Lahmeyer's system, Paget * Oct 12-**89**; reg. of constant current, Dow * Apr 11-**91**

RING, the, Paris exhib. *The Eng* * Aug 9-**89**

SAUTTER-Lemonnier's duplex *The Eng* * Oct 25-**89**

SCIENTIFIC American, the *El Rev Lond* * Aug 5, *Sc Am Sup* * July 30-**92**

SERIES, loss in armature of, Opitz *El Eng* * Aug -**89**

SPARKING and flashing of, M'Berty (full) *El Rev* * May 28-**92**. See also ELECTRIC sparking

STEINLEN, the *The Eng* * Oct 18-**89**

STURGEON'S early *El Wld* * Aug 1-**91**

TESLA unipolar *El Eng* * Sep 2-**91**

THOMSON'S *El Rev Lond* * Aug 15-**90**; and lighting ap. manuf.,

Dynamos
Thomson-Houston works, Lynn, Mass. *E News* * June 30, July 7, 14-**88**
THURY, the *The Eng* July 19-**89**
WADDELL-Entz, and motors *El Eng* * Dec 30-**91**
WESTINGHOUSE, expt. determination of law of variation of elec. mo. force in armature, Searing *El Rev Lond* * Aug 30, do. *F Inst* * Aug; *Eng* * Jan 18-**89**
WESTMINSTER, the *El Wld* * May 18-**89**
WILLSON'S 1000 h.p. *El Rev* * July 4 (large) electroplating *El Wld* * July 4-**91**
WIRES sizes, table *El Rev Lond* Nov 16-**88**
Dyson, George *Inst C E* v 106 -**91**

Eagles, Thomas H. *Inst C E* v 110 -**92**
Earth, polarization of the, by heavy currents, Cuttriss *El Eng* * Sep 3-**90**; elec. conductivity, Appleyard *El Rev Lond* * Mar 11-**92**; Seismograph (instrument), Gray-Milne *El Rev* * Jan 21-**88**; elec. disturbances from elec. lighting, Preece * Apr 27 -**89**
Eng model of, Paris exhib. June 28, do. *E News* July 13-**89**; earth's crust, percentage composition of, F. Clark, June 28-**90**; handling earth, unloading from cars * Apr 18-**91** * Oct 6-**92**
F Inst how measured, Gore, Nov, Dec -**92**; influence of rotation on moving bodies (railroad train), Bavier, abs. *Inst C E* v 99 -**90**, *Zeit deut Ing* -**89**; how long can the earth sustain life, Littell's, June 11-**92**; measuring the earth *Locom* May -**89**; theories, Feb -**90**; population, Feb, *Pop Sci* Jan -**92**
Sc Am Sup earth, as seen from the heavens, Aug 18-**88**; age of, d'Assier, Mar 2-**89**; not a vast cemetery, Prime (cals.) Jan 18-**90**; earth removal by scrapers * Apr 11-**91**, *Zeit Arch Hannover;* theory of, Geikie *Sc Am Sup* Sep 17, 24; age of, Hutchinson, Oct 15-**92**, *Knowledge*, d' Assier *Rev Sci*
Earthenwares, porous, Gilman (full) *Sc Am Sup* May 30-**91**. See also STONEWARE.
Earthquakes, and magnetic phenomena, Milne *El Wld* * Oct 11-**90**; Japan *Eng* * Jan * Feb 5-**92**; theory of, Falb *E News* July 14, 21-**88**. See also BUILDING, earthquake countries
Earthwork, estimating overhaul in, by means of the profile of quantities, Fisher *E News* * Jan 31; cal. overhaul for, Staniford, cor., comput. areas from cross-section notes * Apr 18, 18-

Earthwork
91; retaining walls design, K. Allen *E Rec* * Oct 29 * Nov 5-**92**; cals., Hurst's triangular prismatic formula, J. W. Smith *Inst C E* * v 95 -**89.** See also DAMS; FOUNDATIONS; HARBOR eng; RESERVOIRS; TUNNELING; WATER-works

Easten, James *Inst C E* v 95 -**89**

Edison, Thomas A., inventions at Paris exhib., Hammer *El Wld* * Aug 31 * Sep 7-28 * Oct 5, 12 * Nov 16-**89**; life and inventions, Dickson, por. *Cassier's* * Nov * Dec -**92**; por. *E & Min* * Oct 10-**91**; por. *Sc Am Sup* * Apr 19-**90**

Education, mechan., plea for the printing press in, Hawkins *Am M E* v 8 -**88**; technical, Egleston, Pres. addr. *Am Min* v 16-**88**; technical elec., Owens *El Rev* July 9, electro-technical do. *El Wld* June 18, Jackson, 18, discuss. 25-**92**; technical, ed. *Eng* Jan 24-**90**; eng. schools *E News* files, July- Dec, etc. -**92**; value, and drawing and hand work in pub. schools Canbes *F Inst* Sep -**89**; nat. hist. in elementary schools, Hensoldt, Jan -**90**; of the future, C. King *Forum* Mar -**92**; eng. education in Brit. Dominions (bk.) *Inst C E* -**91**; of the steam engineer (list of studies) *Pwr* Jan -**91**; manual, or industrial training, Taube *Pop Sci* July -**88**; scientific method in, W. Mills * Nov -**92**; technical, Armstrong *R & Eng* Sep -**88**, *19th Cent;* industrial, Pratt Inst., Brooklyn *Sci Am* Oct 6-**88**; technical, Galbraith *Sc Am Sup* Apr 23; the new, Thurston, July 30-**92**; Atkinson *Tech Q* May -**90**; scientific and technical schools, place of in Am. education, Walker, Dec -**91**; technical, R. H. Smith *The Eng* Feb 12, 19, Mar 11-**92.** See also MANUAL training; SCHOOLS

Egypt, the redemption of *E & Min* Apr 11-**91**; land reclamation in *E News* May 12-**88**; and Greece, ed. notes, Aug 23, 30 -**90**; Egyptian monuments, how read, *Littell's* May 14-**92.** See also IRRIG. in Egypt

Eickemayer, Rudolf, por. *El Eng* * Dec 17-**90**, por. *El Rev* * July 9-**92**

Eiffel, Gustavo, por. *Sc Am Sup* * June 15-**89**

Ejector and its work, Hiscox *E Rec* * Nov 19-**92.** See also INJECTOR

Elder, John, statue *Eng* * July 27, do. *Sc Am Sup* * Sep 1-**88**

Electrical arcadia, Johnson *El Wld* Mar 28-**91**; future development, E. Thomson *N E Mag* July -**92.** See also under ELECTRIC eng.

Electric engineering, mod. theories, review, Anthony *El Eng* Feb -**90**; elec. science, see Brit. Assoc. pro. *El Rev Lond* Sep -**88**; industries prog. Jan 2, 9, 23, 30; science, Crookes' addr. (full) * Jan 16, 23, Varley, 23, Feb 6; prog. July 3, 10-**91**

El Rev development, Preece, Brit. Assoc. Oct 13-**88**; prog., '88 * Jan 5-**89**, Feb 20, '92, Dec 31-**92**; possibilities, Madden, June 15-**89**; theories review, Anthony, Feb 1-**90**; mod. uses, Parker * Jan 31, Weyde * Feb 21-**91**

El Wld prog., '87, Wetzler, Jan 14-**88**, (review of half year) June 28, of '90, review, pors. * Dec 27-**90**, of '91, Dec 26-**91**, do. Houston, June 11, needs of the times, Watts, Dec 3, 17-**92**; trans-atlantic trip notes, Lockwood (full) Oct 26-**89**; theories review, Anthony, Feb 1, discuss. * 8; improvements, prodigality in economy, Haskins, Mar 15-**90**; European practice, Hering (full) * Sep 19, 26 * Oct 3, 24-**91**

Eng plant, Paris exhib., Oerlikon, July 26-**89**; possibilities of, W. Crookes (suggestive) *Littell's* Apr 9-**92**, *Fortnightly Rev*; discovery, the latest, Tesla, Gordon *Littell's* Apr 30-**92**, 19*th Cent*; future development, E. Thomson *N E Mag* July -**92**; prog. in '88 *Sci Am* Feb 9-**89**; eng. in Am., Addenbrooke *Sc Am Sup* Feb 15-**90**; possibilities, Crookes, Mar 12 -**92**; eng., Paris exhib. *The Eng* * Aug 9, 16 * Oct 4-18 * Nov 1, 15, 22; eng. in U. S., Addenbrooke, Dec 20-**89**. See also ELECTRICITY; ELECTRO-

ACCUMULATORS. See STORAGE batteries

ACTION, theories review, Carhart *El Eng* Sep, *El Rev Lond* Sep 27, *F Inst* Nov, *Sc Am Sup* Oct 12-**89**; due to an intervening medium, Fitzgerald, Oct 6-**88**

AGING of spirits, Stauffer *El Rev* * Mar 26-**92**

AGRICULTURE, in, cost, ed. *El Eng* May 11-**92**

ALTERNATING currents. See ELEC. currents, alternating

ALTERNATORS coupling in series, Boucherot *El Wld* * Dec 27 -**90**

ALUMINUM, elec. production of, Farmer, discuss. *El Rev* Jan 13-**91**. See also ALUMINUM

AMMETER, the Wood *Sc Am Sup* * Jan 14-**88**. See also ELEC. meters

AMPERE and volt meter, Sankey *El Rev Lond* * Nov 27, Dec 4-**91**. See also ELEC. meters

APPARATUS, appliances, Canadian, Lawson (full) *El Rev Lond* July 4-**90**; ap., Pitts. bureau of electricity *El Rev* July 4-**91**;

Electric APPARATUS

Siemens Bros' *Eng* * July 8, 15 * Aug 5, 19, 26 * Sep 2–16–**92.** See also DYNAMOS, room appliances; RAILROADS, elec. power stations appliances

ARC, photographic study of, Nichols *El Eng* * May 27, *El Wld* * May 30, E. Thomson, discuss. June 6, *El Rev* * June 6, discuss. 13, alternating between a ball and point, expts. do. * Jan 17, do. *El Rev Lond* * Feb 6–**91**; light of, Trotter * May 6, 13, discuss. 20; alt. currents expts., E. Wilson * Dec 30–**92**; and use in lighting, E. Thomson (full) *El Rev* * Feb 28–**91**; normal and hissing arcs, Cravath *El Wld* * Mar 19–**92**; arc resistance and dynamo armature, Feussner, abs. *Inst C E* v 92 –**88**, *Central Elek* –**88.** See also ELEC. lamps, arc

BALANCE, W. Thomson's composite, Gray *Sc Am Sup* * July 14 –**88**, *Industries*

BATTERIES, Paris exhib., Hering *El Eng* * May 21 * June 26–**90**; econ. in primary employed for generating power, Kennelly (full) Mar 30–**92**, do. *El Rev Lond* May 6–**92**; elec. mo. force of, Chronstchoff, Sitnikoff, June 28–**89**, *Compt r*; chem. generators, possibilities and limitations of, Crocker (full) *El Eng* June, *El Rev Lond* June 8, *El Wld* May 26; primary tests, Kennelly * Sep 1–**88**; standard cell, Hering *F Inst* * May –**91**; high power, Sprague, *Sc Am Sup* June 13–**91.** See also STORAGE batteries

BICHROMATE, elec. mo. force of, Reynier, abs. *Inst C E* v 92, 92–**88**, *L'Electrician* –**87–88**; for domestic elec. lighting *Sc Am Sup* * Mar 23–**89**, *Genie Civil*

CLARK cells, causes of variation, Swinburne *El Rev Lond* Aug 28–**91**; Kahle, Aug 26–**92**; setting up *El Wld* * June 7 –**90**

D'INFREVILLE wasteless gravity zinc *El Eng* * Aug 24; three steps in invention of most constant and economical *El Rev* * Sep 10–**92**

EDISON-Lalande *El Eng* * Apr 2–**90**, *Sc Am Sup* * Mar 7–**91**

GALVANIC, notes, Land *El Wld* Mar 15, 22–**90**; practical value of, expts., Sosnovsky, abs. *Inst C E* v 98 –**89**, *Jurn Min Soob* –**89**

GAS, Scharf *El Rev Lond* * Jan 10, do. *Sc Am Sup* * Feb 22, *Zeit Elek*; Ludwig *El Rev* Sep 20–**90**

HELLESEN'S dry elements *El Rev Lond* Feb 6–**91**

LIGHT *Sc Am Sup* * May 31–**90**

Electric BATTERIES, LIGHTING, problem of heat cells, Scheible *El Wld* June 14-**90**
MINIATURE, Farnham, n *The Eng* * Mar 29-**89**, *El Wld*
O'KEENAN primary and applic. to domestic elec. lighting, Shedlock *El Wld* * July 7-**88**
OXIDE of copper, Lalande *El Rev Lond* * June 19-**91**
WEYMERSCH primary *El Rev Lond* June 27, report *El Rev* July 19-**90**
BIBLIOGRAPHY, course of reading, Bell *El Wld* Aug 8, 15-**91**
BLOW-pipe and welding, Sheldon *Sci Am* Feb 2-**89**
BRAKES *Eng* * Dec 20-**89**
BULLETIN board, news, Delany's *El Wld* * July 28-**88**; sporting * Jan 24-**91**
CABLES, submarine, of world *El Rev Lond* Feb 15-**89**, *J Telegr*; Waring's underground *Eng* * Oct 19-**88**; rubber covering machine *Sc Am Sup* * Mar 15-**90**. See also ELEC. wires, underground; TELEGRAPH cables
CALCULATIONS, Sloane *El Rev Lond* Apr 11-**90**
CANADIAN Assoc., Wright, pors. *El Wld* * Feb 27-**92**
CAPSTANS, Nansouty *El Rev Lond* * Nov 22-**89**
CHRONOGRAPH, F. J. Smith *Sc Am Sup* * July 5-**90**
CLASSIFICATION, World's Columb. exhib., U. S. *El Rev* Mar 28 -**91**
CLUB house, N. Y., pors. *El Rev* * Feb 4-**88**
COMPANIES, BRUSH vs. Julien, legal decision *El Eng* Apr 2-**90**; Anglo-Am. *El Rev Lond* July 19, 26, Aug 16-**89**, legal decision, June 6-27-**90**; 2d an. report, Oct 2-**91**
EDISON, *El Eng* pat. suit in England (full) June – Sep -**88**, Westinghouse litigation, Nov -**89**; incand. lamp pat. annulment in Canada, Apr -**89**, Jan; report, Feb; General Co. report, Mar -**90**; incand. lamp literature (full) June 10-24, July 1, 15, 22; Co's (full) * Aug 12; incand. lamp vs. U. S. Elec. Lighting Co., literature, (full) Dec 16, 23-**91**, Jan 13; Edison feeder, models, etc. * May 4, 18, 25, June 22, 29; and Thomson-Houston consolidation, ed. Feb 10; Edison General Elec. Co. report, 17; incand. lamp decision (full) extra, Oct 4-**92**; Edison-Sawyer-Man incand. lamp case, (full) June -**89**, Dec 14-**92**
El Rev Lond and Swan incand. lamp pats. (very full) Apr 20, 27, May 4-25, July 6, 20-**88**, Feb 22, Aug 2-**89**, Aug 1 -**90**; incand. lamp case in Am. June 26, July 3, 10, 24, Aug

Electric COMPANIES, Edison

14-**91**, rep. July 22, pat. hearing, Aug 5, Am. pat. decision, Oct 21-**92**

El Rev Edison vs. U. S. Elec. Lighting Co., decision, May 26-**88**; incand. lamp pats. in Canada, Mar 23; Illum. Co's pro. Aug 24-**89**; General Co. report, Jan 31; decision (very full) * July 25, Aug 1-**91**; and Thomson-Houston consolidation, Feb 13; incand. lamp suit (full) May 7, filament pat. decision, July 2, decision, sup. Oct 8, ed. n 15, Dec 24 -**92**

El Wld Edison works, Schenectady, N. Y. (full) sup. * Aug 25-**88**; Canada decis. (full) Mar 23-**89**; Edison General Co. report, Jan 24; incand. lamp pat. suit, vs. U. S. Elec. L. Co., ed. (full) * June 6, 13, 20, July 18-**91**; General Co. report, Feb 20; and Thomson-Houston consol. Feb 13; incand. lamp case, May 14, Dec 17, opinion, 24-**92**

Eng Edison, Paris, June 14-**89**; and lighting ap. manuf., Thomson-Houston works, Lynn, Mass. *E News* * June 30, July 7, 14-**88**; incand. lamp pats. * Apr 25-**91**, validity in Great Britain, decision *E Rec* Aug 4-**88**; Co's consolidations *Sci Am* Mar 2-**89**; incand. lamp pat. decision *Sc Am Sup* Aug 8-**91**; and Swan, legal trial *The Eng* July 20, decis. Dec 21-**88**

EDISON General Co. report *El Eng* Mar -**90**, Feb 17-**92**, *El Rev* Jan 31, *El Wld* Jan 24-**91**, Feb 20-**92**

GENERAL, Edison and Thomson-Houston consolidation, ed. *El Eng* Feb 10, *El Rev* Feb 13, *El Wld* Feb 13; organization, pors. * May 14-**92**

SWAN United Co. *El Rev Lond* June 8-**88**; and Edison, Aug 2-**89**, Aug 1-**90**, July 22, pat. hearing, Aug 5; report Dec 2 -**92**; and Edison, legal decis. *The Eng* Dec 21-**88**

THOMSON-Houston Co. report *El Eng* Apr 30-**90**, Apr 22-**91**, do. (full) *El Rev* Apr 18-**91**; and Edison consolidation *El Eng* Feb 10, *El Rev* 13, *El Wld* 13; General Co. organization, pors. * May 14; report, Apr 16, *El Rev Lond* Apr 29; works, Lynn, Shaw, plan (full) *El Eng* * June 29, do. *St R J* * Aug * Sep -**92**. See also ELEC. Co's. General

WESTINGHOUSE, Edison litigation *El Eng* June, Nov -**89**; works, Pitts., Wetzler (full) * Oct 19-**92**; Co. report *El Rev* July 19-**90**; circular, May 16-**91**; report, May 28-**92**; shops, overhead cranes in *R Gas* * July 19-**89**

Electric CONDENSERS, history, development and applics., Maver *El Eng* * Jan -**89**; oscils. in charging of, Robb *El Rev Lond* * Dec 16; spark and air jet expts., E. Thomson * Mar 25, *El Eng* Feb 17, *El Wld* * Feb 27-**92**; influence on disruptive discharges, Acheson *El Rev Lond* * Aug 10 * Sep 28, cor. *El Rev* July 7-**88**; eccen. cylinders problem, Kennelly *El Wld* * Nov 26; future in elec. lighting, Swinburne * Jan 9, 16-**92**, *Industries*

CONDUCTORS, anti-effective cop. in parallel or coiled, for alt. currents, W. Thomson *El Wld* * Sep 27, *El Eng* * Sep 24-**90**; insulated, Bowstead, Mar 16-30, Apr 6, 13, do. Williams, Aug 17, 31, Nov 30-**92**; absolute vacuum as a non-conductor, Weyde *El Rev* * Dec 22, *El Wld* * Dec 22-**88** *Sc Am Sup* Jan 19, *El Rev Lond* Jan 11; size cal., Kempe, May 24-**89**; electrostatic force between, Lodge (full) Oct 10; econ. in, Kilgour, Dec 12, 19-**90**; insulated, spec., Preece, Dec 11, 18-**91**; heating of by elec. currents, Kennelly *El Wld* * Nov 23, diags. 30 * Dec 7, 14-**89**; law of economy, Santarelli, July 26, Aug 2; econ. in, Kilgour, Dec 27-**90**; most econom. loss, Roberts, July 18, 25, Aug 29-**91**; relation between rise of temp. and current, Wadsworth * Feb 27 * Mar 12; molecular movement in, Dolbear * Apr 9-**92**

CONDUITS, Chenoweth's, com. report *F Inst* Sept -**89**; elec. system, Harding *El Rev* * Dec 6-**90**; elec., Interior and Insulation Co. system, com. report, Johnson * Mar -**91**

CONGRESS, Paris internat. '89 *El Eng* Nov, Dec -**89**, *Industries*, (full) *El Rev Lond* Sep 6-27, Oct 4, *Eng* Sep 6-27-**89**; Frankfort internat. Sep 18, 25-**91**

CONSTANT shunt method, errors in, Puffer *Tech Q* Feb -**88**

CONSTRUCTION Co., Bushbury, England *The Eng* Nov 27-**91**

CONVERTER, Ferranti and meter *El Wld* * Dec 15-**88**; Westinghouse, effic. tests, Cross * Jan 18-**90**

COPPER tempered for elec. work, Bliss *El Wld* Feb 1-**90**; manuf, F. E. & A. S. Elmore pats. *E News* Oct 18-**90**; depositing proc. Feb 14, 21-**91**. See also COPPER

COUNTER and shaft rev. indic., Weaver *El Rev* * Apr 11-**91**

CRANES, 10-ton travelling, Paris exhib. *The Eng* * Aug 16-**89**. See also CRANES

CURRENTS, *El Eng* alternating, energy of, Shallenberger * Mar; distrib. by, T. C. Smith, Mar; heating effects, Preece, tables, June. *Industries;* vs. contin., Slattery, May, Cutter, Bliss *El*

Electric Currents

Eng * July; det., constant shunt method errors, Puffer, July -**88**; mod. views, Rowland, June: alt., working, Mordey (full) July, Aug * Oct -**89**

El Eng alt. ap. effic. tests, Duncan * Apr 2; heating effects, Preece, June 11: alt. ap. expts., Ryan * July 2; alt., rectifying by synchronizing devices Steinmetz, 16: in aerial telegraph conductors, obs., Bennett * Sep 10; alt., in parallel conductors, W. Thomson * 24-**90**

El Eng earth curs., Finn, Jan 14; alt., distrib. and care of, T. C. Smith, Feb 25; alt., high frequency expts., Tesla * Mar 18, 18, E. Thomson, Mar 11, Apr 1, Tesla, May 27 (full) * July 8; curves of flow, ap., Frolich * Aug 3-**91**; alt. cur. motors, Stanley * Mar 2; underground op. of high tension, Leslie, 2; alt. expts., Duncan * Sep 7; alt. high tension, Siemen's expts., Cammer * Nov 9-**92**

El Rev Lond phases difference, Ferraris * Feb 3-24; alt., Westinghouse vs. Sun Co. decision Boston, Sep 7; alt. vs. direct, comparative danger, Weyde, Oct 5-**88**; alt., power transmission difficulties by, Reymond (full) * Feb 1; alt. machinery, Kapp, Mar 1; induced strength, Cross, Wins * May 24; high vs. low tension, 31; alt. working, Mordey (full) May 24, 31, June 14, Aug 2; nature, Rowland, July 12; alt. and steady relative effects on conductors, Preece * Sept 27 -**89**

El Rev Lond alt. and contin., respective merits, Jan 10, 24; alt., in relation to human body, Lawrence, Apr 4; distrib. in networks of elec. conductors, Herzog (full) * Apr 18 * May 2; alt. ap. effic. tests, Duncan, Apr 18, 25; high tension underground circuits, Brit. authorities on, 18; alt., induction, E. Thomson * 25; alt., storing up, Foeppl * May 16, 23; in telegraph conductors, Bennett * July 25; what constitutes a dangerous, Perry, Aug 29, Sep 5; dangers, Morton, 12-**90**; alt., of high frequency, Tesla, Mar 6, Apr 3, physiological effects of, E. Thomson, Mar 20, Apr 17, Tesla, Thomson, May 22, expts., Tesla (full) * July 24, 31 * Aug 7; alt., condensers, Swinburne, Apr 3; rotary and art of measuring them, Gorges * Apr 17, 24; measurement of power supplied by to any circuit, Ayrton * 24; alt., flow effects, Fleming * May 8-22; rotary, expts., Bois-Reymond * June 5; work and magnetic det. in armatures, Hummel * Oct 2; alt., polyphased * Oct 17-30 * Nov

Electric CURRENTS

6–20 * Dec 25 -**91**; alt., power development, Hering * Jan 15, 22; alt. expts., Siemens (full) * Mar 4; earth curs., Preece, Aug 19; alt. and elec. mo. force quantity diag., Whitwell * Dec 2-**92**

El Rev alt., Shallenberger * Mar 17; alt. vs. contin., Slattery, 24; constant shunt method errors, Puffer, Apr 21; contin. vs. alt. cur. unlimited, Bliss * June 9; alt. vs. direct, comparative danger, Weyde, sup. Sep 8-**88**

El Rev mod. views, Rowland * June 8-**89**; alt. high tension circuit, Jacquin, Mar 22, *Lum Elec* Feb 25; alt. effic. tests, Duncan *El Rev* Apr 5; heating effects, Preece, June 14; alt., properties, E. Thomson, Nov 22-**90**

El Rev alt., interference with, Ayrton, Apr 4; alt., of high frequency, Steinmetz, 4, Tesla, May 30, very high frequency, do. (very full) * July 11; German cur. transformer * June 20; alt., polar diag. and applic. to inductive resistances, Steinmetz (full) * 20; cur. curves det., Frolich * Dec 19; alt. polyphased * Nov 28-**91** * Jan 16; alt. arc air blast for raising frequency, Thomson's * Mar 12; alt. expts., Duncan * Aug 6-**92**

El Wld alt. and undulatory, elec. wave and phase indicator for, E. Thomson * Jan 28; heating effect of, Preece, table, May 19; contin. vs. alt. unlimited, Cutter, June 2, 9; alt., admission into N. Y. City, cor. (full) July 28; alt., danger of, physiological tests, H. P. Brown (full) * Aug 11, Gutmann, Set 8, 22; alt., Westinghouse vs. Sun Co., Boston decision * Aug 25-**88**

El Wld nature, Rowland (full) * June 1; alt. and contin., comparative danger to life, H. P. Brown's expts. review, Gutmann, cor. July 13; contin. direct from alt. circuits, Tesla's method * Nov 2, do. Gaillard * 2; contin., obtaining from alt. curs. without mechan. commutators, Ries * 23-**89**

El Wld alt., peculiarities, Sumpner, Jan 11; alt. ap. effic. tests, Duncan * Apr 5; alt. induction phenomena, E. Thomson, and discuss. 19; alt. vs. contin. in relation to the human body, Lawrence, 26; distrib. in networks of elec. conductors, Herzog (full) * May 3 * Aug 23; physiological expts. with, Tatum, 10, correction, 17; alt. ap., Ryan * July 5; alt., in parallel conductors, W. Thomson * Sep 27-**90**

El Wld arc, stabled by the regulator, Higham * Jan 17; earth curs. phenomena, Finn * 24; alt., of very high frequency, Tesla, Feb 21, E. Thomson, Mar 14, Tesla, 21, Apr 11, (very full)

Electric CURRENTS

* July 11; alt., distrib. and care, T. C. Smith, Feb 28; alt. flow effects, Fleming (full) May 23 * June 13-27; alt. potentiometer, Moler * May 30, discuss. June 13; rotary, expts., Bois-Reymond * 27; alt. and poten. difference analogies in measurement of power, Ayrton * Aug 22, 29-**91**

El Wld alt., measurement of power in any circuit, Hering * Jan 2; alt., some phases of, Evans, 23; conductors, relation between size of wire and cur., Wadsworth * Feb 27 * Mar 12; op. underground high tension from a physical and financial standpoint, Leslie (full) Mar 5; alt., measurement of the lag between, Holz * 26; alt., of high frequency, Tesla's expts., Raverot * 26, and high poten., expts., Tesla (very full) * May 7; cur. controllers for medical work, Waters * Apr 23; alt., of high poten. and low frequency, expts., Perkins * 30; alt. distrib. systems with condensers, Reckniewski * June 4; alt., expts., Duncan * Aug 6; polyphased, Winand * Nov 12; earth curs., Finn, 19-**92**

E News heating effec on insul. copper wire, diag. * July 11-**91**; induced, an experimental analogue for direction of, Rondinella *F Inst* * May; high voltage, value of oil as an insulator Brooks, n June; induction of and induction coils, E. Thomson * Aug -**91**; polyphased, Winand (full) * Oct -**92**; alt., and applics., Tesla, abs. *Inst C E* v 106 -**91**; alt., distrib. and care of, T. C. Smith *Pwr* Apr * May -**91**

Sc Am Sup alt., dynamic rotation by, Ferraris * July 7-**88** * *Industries;* contin. and alt., comparative merits, Rühlmann, *Sc Am Sup* Jan 18; effects of heavy, Hopkins, Apr 5-**90**; alt., of high frequency, Tesla (full) Mar 7; two or three phase alt. systems, Hering * Oct 3-**91**; alt. systems, Low, Feb 6; op. of underground high tension, Leslie, Apr 2-**92**; alt., expts., E. Thomson * *Soc Arts Mass* -**90**; death by, Houston *The Eng* June 22; heating effects of, Preece, July 6-**88**

CUT-out, Fisher aut. *El Eng* * May 4, *El Wld* * May 7-**92**

DIAGRAMS and symbols, chart, Crocker *El Eng* * May 13-**91**

DICTIONARY, Houston *El Eng* Nov -**89**; proposed, Benjamin, June 22; Houston, July 6-**92**, do. bk. review *El Wld* July 20-**89**, June 11-**92**

DISCHARGES, disruptive, in. lead cables, Rudd *El Eng* * Mar, *El Rev Lond* Mar 15-**89**; stratified, expt., Brooks * Apr 1-**92**; motion of atoms in, Trowbridge *El Rev* Dec 13-**90**; disruptive, influence of condenser on, Acheson *El Wld* * July

Electric DISCHARGES
7; disruptive and relation to underground cables, Acheson * Sep 8-**88**; of a Leyden jar, Lodge (full) *Sc Am Sup* * Apr 27 -**89**

DISTRIBUTION, *El Eng* contin. and alt. cur., comparative value, Leonard, Apr -**88**; Huntley's zone system * Sep 16-**91**; multiple arc, det. of wire for, Woodbridge, Apr 13; three-wire system, new, Leonard * June 8-**92**

El Rev Lond system, Edmunds * Nov 30-**88**; Webber, Feb 6, 20; Kennedy's method * Mar 20, 27 * Apr 10, 24-**91**; by alt. curs. and transformers, Kennedy, Apr 22 * May 6, 20, 27, by multiphase curs. do. * Sep 9; improvements * Dec 2; three-wire system (full) 9; multiphase transmiss., Reckenzaun, Apr 29, Dec 30-**92**

El Rev distrib. by alt. curs., Carpenter, Mar 3; converter and contin. cur. systems, compar. value, Warner, Apr 14-**88**; Patten system * Nov 23, 30-**89**; developments, Forbes, Mar 19 -**92**

El Wld distrib. by alt. curs., T. C. Smith * Mar 3; contin. and alt. cur. systems, compar. value, Leonard * 24; system, Edmunds * Oct 13-**88**; Edison three-wire system, Jenks (full) * July 20-**89**; distrib. of energy by constant curs. Bernstein * Jan 25; by transformers from central and eccentric stations, Ganz system, Fleming (full) July 26 * Aug 2-30, Sep 6 * Oct 25 * Nov 1-15, 29 * Dec 6, 27-**90** * Jan 10, 24, 31 * Feb 14; econ. in conductors, Kilgour * Jan 10; practical prob., Roberts, Sep 5-**91**; and transmiss., multiphase, Reckenzaun * May 21, June 11; by multiphase curs., Kennedy * Oct 1-**92**

Eng Edmunds' system * Nov 23-**88**; prob., Brooklyn subway com. report *E & Min* Jan 11-**90**; by constant cur. system, Bernstein, abs. *Inst C E* v 99 -**90** * *Elek Zeit* -**89**; by multiphase curs., Kennedy *Pwr* Nov -**92**; systems, Stanley * *Soc Arts Mass* -**88**

DOCKYARDS and navy, elec. applics. to, Deadman *El Wld* Aug 13, 20, Sep 10-**92**

DOMESTIC uses, for, Leonard *El Wld* * Jan 30-**92**

DRILL, percussion, Marvin *El Eng* * Aug 17, *El Rev* * Aug 13, (full) *El Wld* * Aug 13-**92**

DYAMOTOR, Lahmeyer triphase *El Rev* * Jan 9-**92**

DYNAMIC lines, direct optical projection of, Moore *Sc Am Sup* * Apr 21, 28 * May 5-**88**

Electric DYNAMOS. See DYNAMOS

EIFFEL tower plant *Eng* * June 21-**89.** See also under ELEC. lighting

ENERGY, from carbon without heat, Case *El Wld* Jan 14, 21, *Sc Am Sup* Jan 21, *El Eng* Feb -**88**; from solar radiation, Osmond, Mar -**89**; conversion of mechan. into elec., Arnall *El Rev Lond* * Feb 27; cost, ed. Apr 17; Frager's energy meter * June 19-**91**; measurements of, Potier, Sep 7-**89**; distrib. of, by constant curs., Bernstein * Jan 25; util., Watts, July 12-**90**; generation and distrib. of, cost, Crompton, and discuss., insets (very full) *Inst C E* * v 106 -**91**; conversion of heat direct, Gülcher, abs. v 105 -**91**, *Sitzung Akad Wissen Berlin* v 19 -**91**

ENGINE, magnetic recip., Van Depoele *E News* Oct 4-**90**

ENGINEERS, Am. Inst. Trans. and pro. files **88-92**; pors. *Cassier's* * Aug -**92**; (full) *El Eng* * Jan-Mar, May, June, Nov, Dec -**88**; Jan, Feb, Apr, W. Thomson, addr. May, June, July, Oct-Dec -**89**, Jan, Feb, Apr 2, May 28-**90**; *El Rev Lond* Jan 18, 25 * Feb 22, Mar 8, 15 * Apr 5, 26, May 3-17, 31, June 7, 14 * Nov 15-29, Dec 6-20-**89**, Jan 17, 31, Feb 14-28, Mar 7, 14, 28, Apr 4, 18, May 16 * 23, 30, June 6-20 * July 18-25 * Aug 1-15, Nov 28, Dec 5-19-**90** * Jan 16, 23, Feb 6, 20, 27 * Mar 6 -20, Apr 10 * May 1-22 * June 5 * Nov 27, Dec 4-18-**91**, Jan 29 * Mar 4-25, Apr 1, 15, May 6-27, June 3, 24, Oct 28, Nov 25, Dec 2-30-**92**; and discuss. (full) *El Rev* * Sep 28-**89**; *E News* July 21-**92**; *The Eng* Jan 13-**88**

ENGINEER'S technical education, Jackson *El Rev* June 25-**92**

EVAPORATION, Crookes *El Eng* * July 15, *El Rev* * July 18, *El Wld* * July 11, 18 (full) *Sc Am Sup* July 18-**91**

EXCAVATOR (motor), Osgood Dredge Co. n *E News* * Sep 20 -**90**

EXECUTION, Moses *El Rev* Aug 17-**89**; Kemmler's, Talbot, Apr 25-**91**; Heinrichs *Sc Am Sup* Aug 10-**89.** See also ELECTROCUTION

EXHIBITIONS, Crystal Palace *El Rev* Apr 30, *Eng* * Mar * Apr, July 1, *The Eng* * Jan-June -**92**

EDINBURGH *El Rev Lond* * Aug 1, 22, *The Eng* * July 11, 25 * Aug 15, 29 * Sep 26 * Oct 10-**90**

FRANKFORT *El Eng* July 15 * Aug-Oct-**91**; notes, Hering *El Wld* Jan 9-**92**; Paris, notes, Oct 5, 12-**89.** See also EXHIBITIONS

Electric FIELD, magnetic, change of form affecting, Dolbear *El Rev Lond* * Mar 27, *El Wld* Mar 14, *El Eng* * Mar 11-**91**, graphic representation, Houston * July 20, *F Inst* * July, insets * Sep-**92**; Gray *El Rev Lond* Oct 19 * Nov 2, 9-**88**; physical fields, cor. Jan 24, Feb 21, Apr 11-**90**; a permanent magnetic, Hibbert * Aug 5; the Schuckert field motor * 19-**92**; rotary, kinematics of, Kelly *El Wld* * Apr 16-**92**

FIRE engine, Dewey's *El Rev* * Mar 7-**91**; Fish, Apr 12-**90**

FITTINGS, house, N.Y., Martin *El Eng* * May 25-**92**; in the dwelling, Allam, *Sc Am Sup* Mar 15-**90**

FIXTURES, exterior *El Wld* * Dec 5, 12-**91**; decorative, Wall *E Mag* * Oct -**91**

FORGING, Burton system *El Eng* * Jan 27-**92**, do. spike machine *El Rev* * Sep 13-**90**

FORMULAS, relation between magneto motive force and resulting magnetization, Emery *El Eng* * Aug 17-**92**

FRAUDS, Knudson *El Eng* Jan 6-**92**

FURNACES, early forms, Pepy's, Houston *F Inst* Jan, Depretz's, Lontin's, Feb, Johnson's, Watson & Prosser's, Apr * June, Werdermann's, July -**88**, do. *El Rev Lond* Apr 6, 27, June 1 * Aug 24-**88**; first * Aug 5-**92**; Edison's *Sc Am Sup* * Oct 31-**91**

FUSES and safety cut-outs, Bathurst, *El Wld* * May 10-**90**

GALVANOMETER, standard ballistic *El Eng* * Nov 16-**92**; mag. and telegraphic, chronol. hist., Mottelay *El Wld* Jan 2-30, Feb 6-27-**92**. See also GALVANOMETERS

GENERATORS, thermo-elec. *El Eng* * Sep 3, Edison's novel * 3, gaseous * 10-**90**; commercial rating of, Grier, Jan 28; constant cur. regulation * Apr 15; Edison's direct gen. from carbon, n * Oct 7; polyphasal, Pupin * Dec 30, (full) *El Wld* * Dec 26 (full) *El Rev* * Dec 26-**91**, discuss. * Jan 16-**92**; distrib. and measurements, Lawson *El Rev Lond* June 27, *Can C E*, *El Wld* May 24-**90**; Edison pat. *El Rev* * Aug 30 * Sep 20-**90**; Brush alt. cur. system *El Wld* * July 13-**89**; commercial rating, Grier, Jan 24; reg. of constant cur., Dow * Apr 11-**91**; alt. cur. and receivers, Anthony * *Soc Arts Mass* -**88**; catelectric, Acheson's *The Eng* Aug 23-**89**, *El Wld*

GIRL exposé, Perry *El Rev Lond* * Dec 18-**91**, *Sc Am Sup* * Jan 2-**92**

GROUND detector, Edison's, Kennelly *El Rev Lond* July 27, *El Wld* * July 7-**88**

Electric HANDWRITING, transmission of, Gump, *Soc Arts Mass* -**89**

HEAT excitement in electrolytes, Planck *El Rev Lond* Apr 4, 18, 25, May 2, 16, 30, June 6, 13-**90**; regulation system *El Wld* * Mar 1-**90**

HEATERS, Gutmann's n *El Eng* * Aug 26-**91**; Burton, n *El Rev* * May 10; Abshagen's pat. * Oct 11; for cars, Hanna * Dec 6; Talmage pat. * 27-**90**; defence of, Burton, cor. *E News* Aug 23-**90**; Merrill, May 19-**92**

HEATING, Dewey's *El Eng* * Oct 5-**92**; effect of elec. curs., Preece, tables, June -**88**, June 11, do. *El Rev* June 14-**90**, do. table *El Wld* May 19, do. *The Eng* July 6, do. *El Rev Lond* May 11-**88**; of wires and lamp filaments, Rain, Dec 6 * 13; of conductors by curs., Kennelly (full) * Dec 6, 20, 27-**89**; of thin wires, Bernstein *El Wld* Apr 27-**89**; of cop. wires., Barbieri * Mar 14; Dewey * Oct 3; thermal emissivity of thin wires in air, Ayrton, Kilgour, Dec 19-**91**; as compared with coal direct, Stern, n Dec 24-**92**; and smelting, Emmens *E & Min* July 16-**92**; effect on insul. copper wire, diag. *E News* * July 11-**91**; effect of curs., Preece *Sc Am Sup* Aug 18-**88**; Dewey * Oct 24-**91**

HERTZ'S expts., Joubert *El Rev Lond* * Aug 30-**89**, undulations, Bertolini *El Wld* * Jan 10-**91**, *Eng*, *Sc Am Sup* * Oct 5-**89** * Jan 25-**90**

HISTORY. See ELECTRICITY, history

HORSE power, for lighting, motor and railroad circuits, table, inset *El Eng* sup. Feb 25-**91**; characteristics, diag., Crane *El Wld* * July 13-**89**; curves, Herzog's, diag. * Mar 26-**92**; *Sc Am Sup* Sep 19-**91**; ed. *The Eng* Aug 21-**91**

HOUSE fittings, N. Y., Martin *El Eng* * May 25-**92**; Allam *Sc Am Sup* Mar 15-**90**

HYSTERESIS, loss by, Tesla reply to E. Thomson *El Eng* May 7; law of, Steinmetz * Dec 17-**90**, Jan 27 * Feb 3-17 * Mar 9, 16, 16 * Oct 12-**92**, (full) *El Rev* * Jan 30 * Feb 13, 27, Mar 12 -**92**, do. abs. *Inst C E* v 109-**92**, *Am Elec Engrs* -**92**, do. (full) *El Wld* Jan 30 * Feb 6, Oct 29-**92**; and Foucault losses separation, Kapp * May 2-**91**; measurement in, Evershed * Oct 15, 22-**92**

ICE-harvesting machinery, Kinsman *El Eng* * Dec 30-**91**

INDEX of current elec. lit. *Am Inst Elec Engrs* May -**88** and files

Electric INDUCTANCE and proposed unit 'the Henry,' Kennelly (full) *El Wld* * Dec 27-**90**

INDUCTION *El Eng* coil retardation in, Stanley (full) * Jan, Jan, do. *El Rev Lond* Jan 13; Slattery system *El Eng* * Mar -**88**; self-induc., Acheson, notes * Apr; measurements by telephone, Strecker * Oct -**89**; alt. cur., E. Thomson * Apr 9; self-induc., industrial util. of counter elec. mo. force of, Lockwood, May 28, do. (full) *El Rev Lond* Aug 29, do. *El Wld* May 31; and proposed unit 'the Henry,' Kennelly, Jan 9, Feb 20-**91**, do. (full) *El Rev* * Dec 27, do. (full) *El Eng* * Dec 24-**90**, Feb 4-**91**; by high poten. discharges, E. Thomson * Feb 17, do. *El Rev Lond* * Mar 18, do. *El Wld* * Feb 20; dynamic, at high potens. and frequencies * Apr 15, do. *El Rev* * Apr 2, do. *El Wld* * Apr 2, do. *Sc Am Sup* * Apr 23, do. *El Eng* * Mar 30 -**92**

El Rev Lond coils expts., Duncan * June 15, do. *El Wld* * Apr 28 * May 19 * Aug 18-**88**; general law in circuits without resistance, Lippmann *El Rev Lond* Aug 23-**89**; electro-magnetic expts., E. Thomson's, Fleming * May 23, 30, do. (full) *El Wld* * June 14, 21, do. (full) *Sc Am Sup* * Aug 9, 16; and coils, Moon *El Rev Lond* Dec 12-**90**; in multiple core cables, Dresing * May 22-**91**; multiple machine for high tension electricity, Armstrong * July 22, 29-**92**; Carty, discuss., Kennelly (full) *El Rev* * Apr 11-**91**

El Wld self-induction measuring by Ayrton & Perry's secohmeter * Apr 20; mutual null method of measuring, Kennelly * Oct 5-**89**; electro-mag., simple deductions from first laws of * Jan 11; alt. cur. phenomena, E. Thomson and discuss. Apr 19; self-induc. of a circular loop, Blathy, May 31-**90**; self-induc. of coil, det. from its dimens., Place, Nov 26; self-induc. effects, Bedell, Dec 24-**92**

Eng Huyghen's gearing, Rayleigh, May 30; alt. cur., E. Thomson * Aug 1, ed. 15-**90**; unipolar, Hoppe, abs. *Inst C E* v 92 -**88**, *Elec Zeit* -**87**

INDUSTRY and eleventh census, table, Garratt *El Rev* Oct 26-**89**

INFLUENCE machine, Wimhurst's alt. *El Rev Lond* * Apr 24, *El Wld* * May 9-**91**, *Eng* * May 4-**88** * Apr 17-**91**, *Sc Am Sup* * May 26-**88**; theory, Gray *E Rev Lond* * Aug 12, Taylor * Oct 7-21-**92**

INSTRUMENTS, manuf. in Am., Wetzler (full) *El Eng* * Feb 24-**92**; Mather Elec. Co. *El Wld* * Mar 24-**88**

Electric INSULATION, *El Eng* and installation of wires, E. Thomson, Mar, do. *El Rev Lond* Mar 23, do. *El Rev* Feb 25-**88**; resist. of elec. light installs., Jamieson, Jan 25, do. *El Eng* Oct -**89**; resist. measuring, Patterson * May 20-**91**, glass and porcelain, tests, F. Jones, Feb 10; Edison, July 13, do. *El Wld* July 2, do. *Sc Am Sup* Aug 6, do. *El Rev* July 2; oil vs. air as, Wins, Nov 26, do. *El Wld* Nov 26, Dec 3-**91**, Dec 10-**92**, do. *El Eng* * Nov 23; resist. of cotton and silk covered wires, Luquee * Dec 28; micanite and applic. to armature insul., E. Thomson, 28, do. *El Rev* * Dec 31, do. *El Wld* * Dec 31-**92**

El Rev Lond insul., okonite, June 8; Picou, Nov 23-**88**; resist. of station, Jamieson, Jan 25; measurements at the Vienna Palace, Waltenhofen * Feb 15, 22; standard for light circuits, Fish, 15; thickness of, A. Thompson, 22-**89**; of cables, influence of elec. tension on, Palaz, Oct 24-**90**; high, of wires, commercial measurement, Hering * Mar 27-**91**; oil, as, expts., Hughes, Mar 11-**92**; in marine work, hist. *El Rev* Dec 14-**89**; insul. materials behavior under high poten. differences *El Wld* * Apr 9-**92**; wire insul. measurement, Picou, abs. *Inst C E* v 92-**88**

INSURANCE, light and power rules, Boston Manuf's. *El Eng* Aug 20; rules, Hartwell (full) *El Rev Lond* Sep 12; and regulations, N. E. Ins. Exchange (full) Dec 26-**90**; rules, England *El Rev* Jan 14-**88**; station ins., Barton, May 31, July 19-**90**; and wiring rules, com. report, Sep 12-**91**; elec. and ins. interests, Alexander *El Wld* Feb 22; stations hazards, Low *Sc Am Sup* Apr 9-**92**; lighting and fire ins. rules, Hartwell *The Eng* Dec 5-**90**

INVENTIONS, of Henry Pinkus, Tanner *El Rev Lond* * Jan 8-22 -**92**; effect of, Brackett *El Rev* Apr 18-**91**; progressive * Jan 2-16-**92**

INVESTMENTS in country districts, Black *El Wld* Aug 20-**92**

IRRIGATION, Collins *El Eng* * Apr 16-**90**

KIRCHOFF'S laws and applic., Rimington (full) *El Rev Lond* * Mar 2-30 * Apr 6, 13-**88**

KITE, Franklin's expt., McAddie *El Rev* * Aug 22-**91**, *El Wld* Sep 24-**92**

LABORATORY, Hopkins *Sc Am Sup* * Mar 21-**91**

LAMP posts, Berlin *E News* * June 16-**88**

LAMPS, and wire cals. without tables or curves, Roberts *El Eng* Aug 3-**92**; max. effic., Howell *El Rev Lond* June 29-**88**. See also under ELEC. Co's, Edison, etc. — Lighting

Electric LAMPS, ARC, and mechanism, S. P. Thompson (very full) *El Eng* May * July - Sep, *El Rev Lond* * Mar 15-29 * Apr 12, 19, *El Rev* Apr 13, (full) *Sc Am Sup* * Apr 20, 27-, **89**; effic., Nakano *El Eng* * July, *El Rev Lond* * Sep 6, (full) *El Wld* * June 1-**89**; Brush double carbon, legal decis. *El Wld* Jan 4, do. *El Rev* Jan 4; universal * Oct 11-**90**; cost of lighting (various Am. cities, 38) Mar 26; the Riedel * Apr 9-**92**; manuf. for low tension circuits *El Wld* *Apr 30-**92**; Saundersons * June 7-**90**, *El Eng Lond*; light of *Eng* May 6; the Crompton-Crabb * June 24-**92**; and incand., probs. in the physics of, Fleming *Sc Am Sup* * Aug 23-**90**

CARBONS, properties of, Best (full) *El Eng* * Aug -**88**; Fisk, July 27-**92**; life and effic., Marks (full) * May 28, *El Rev Lond* Aug 8, (full) *El Rev* * May 31-**90**; tests, Peck, Feb 22, *El Wld* Feb 22, Law, 22, life and effic., Marks (very full) * May 31-**90**; different forms, Warner, Sep 19-**91**; Fisk, July 23; Nutting's carbon feeding * 30-**92**

GLOW-lamps, pats., ed. *Eng* July 20-**88**; max. effic., Howell, abs. *Inst C E* v 93 -**88**, *El Eng* v 7 -**88**. See also ELEC lamps, incand.

INCANDESCENT, max. effic. of, Howell, discuss. *Am Inst Elec Engrs* May -**88**, (full) *El Eng* * May -**88**; relation between initial and average effic., Peirce * July; filaments form and effic., Reed, Dec -**89**; data and testing, Puffer (full) * Jan * Feb * Apr 2; Jenks' air space cut out * June 11-**90**; rating candle power of, Bell, Feb 25; the Beacon vac. pump for exhausting * Mar 4; wiring rules and formulas, Hering * Apr 1, 8, Loomis 15, Pike 29; highest econ. in, Leonard 15; Grier 22; econ., Weaver, June 3; Edison vs. U. S. Co. Dec 16-**91**; commercial rating of, Wirt * June 22; life and effic. test of, Thomas, July 13; life of, relative to mercury and metallic vac. pumps * Dec 14-**92**

El Rev Lond 'flashing' carbon filaments at different temps., Powell, May 4-25; effic. with direct and alt. curs., Ayrton, Perry, June 1; sectional testing of filaments, Powell, Oct 5-**88**; form and effic. of fils., Reed, Dec 20, 27; heating of, Ram, 6 * 13-**89**; highest econ. of, Leonard, Apr 24; Grier, May 8, econ., Russell, 8, 15-**91**; Edison pat. Am. decis. Oct 21-**92**

El Rev highest econ., Leonard, Apr 18; Grier, May 2:

Electric LAMPS,
blackening of, Powell, July 18-**91**; life and effic. test, Thomas (full) * July 16; Westinghouse new (non-infringing) * Oct 22 -**92**

El Wld max. effic., Howell * Apr 14, 28; (wiring) leads, table, July 14-**88**; relation between initial and av. effic., Peirce (full) * June 8; fits. from and effic., Reed * Nov 30, shape and size do. discuss., Dec 14-**89**; Berrenberg's vac. pump * Apr 26; life of, table, May 3; Edison special, Jackson, Sep 27-**90**; highest econ., Leonard, Apr 18; Grier, 25-**91**; Ries' regulating socket * Mar 19; curves and wire cals. without tables, Roberts * July 2; life and effic. test, Thomas (full) * 16, do. Gossler (full) * Sep 17; age-coating in, Nichols * Nov 12; pats., separable or detachable, Böhm * Dec 3; advantages of forcing at expiration of their life, Hering * 24; life and effic. tests, Feldmann * 17-**92**, *Electric Lond*

Eng glow lamp pats., ed. July 20-**88**; deterioration of, ed. Jan 23-**91**; glow lamps, max. effic. Howell, abs. *Inst C E* v 93 -**88**, *El Eng;* and arc, probs. in the physics of, Fleming *Sc Am Sup* * Aug 23-**90**; data and testing, Puffer (full) *Tech Q* * Feb, insets * May -**90**; candle power relative to voltage, Ferguson, insets * July -**91**

PORTABLE, Friedlander's *The Eng* June 1-**88**

LAUNCHES, Reckenzaun (full) *El Eng* Aug 13-**90**; on the Thames river, Forbes *El Wld* Oct 5-**89**; *E News* Aug 23-**90**. See also LAUNCHES

LIGHT, car, Penn. R., inset *E News* * Aug 23-**90**; and power long dist. transmission, Scott *El Eng* * June 15; lights, photometric study of, Genung *El Rev Lond* * Dec 16 *El Wld* * May 28-**92**; signals, Conz incand. system *The Eng* July 6-**88**. See also ELEC. Lighting

LIGHTING, from financial standpoint, Wiman *Cassier's* Apr -**92**; dangers, Edison *El Eng* Dec -**89**, Jan -**90**; in railroad service, Leonard, July 9, do. *E News* July 12-**90**

El Rev Lond Fontaine, Sep 27-**89**; standard specs. July 4; sanitary aspects, Preece, Aug 29; in its relation to the consumer, Naylor, Dec 5-**90**; mains, Preece, May 22; nine years' record, Bd. of Trade report, Aug 14-**91**; English stats., table, Jan 8; figures, Booth * Apr 1, 8, 22 * May 27, June 17 -**92**

El Rev convention, Pitts. (full) Feb 25-**88**; hazards, Has

Electric LIGHTING

kins, Oct 5-**89**; in the tropics, Fleming, May 31; superior to gas, Hoho, Oct 25-**90**; cost, table, com. rep. Feb 28-**91**

El Wld by storage bats., cost, Oct 18-**90**; data, com. rep., table, Feb 28; prices, July 4; relation to optical science, Boyle (full) * Nov 14-**91**; from finan. standpoint, Wiman, Mar 5; supply cost, Hopkinson, Dec 3, 10, 24; photometric study of, Genung * May 28, do. *El Rev Lond* * Dec 16-**92**

Eng central station, Crompton (cost, etc.) Apr 20-**88**; cost, ed. Nov 11-**92**; artesian well plant *E News* * Sep 29-**88**; cost of, various cities, n Oct 5, 12-**89**, Jan 25; Kansas City, June 28; candle power, Kingman, cor. 28-**90**; Geipel *Inst M E* Feb -**88**; and working, Preece *Sc Am Sup* June 2, 23; in Am., Forbes (full) Oct 27-**88**; Fontaine report, Nov 16-**89**; cost *The Eng* Mar 11-**92**

ACCESSORIES, English and Am. differences, Bathurst *El Wld* July 26-**90**

ANNAPOLIS, Md. station *El Wld* * July 27-**89**

APPARATUS, rules for *E Rec* Aug 16-**90**

ARC, Westinghouse alt. system *El Eng* * Apr 2; cost, various towns and cities, Rosewater, 9-**90**; use of arc in, E. Thomson (full) * Feb 25; rates, various cities, Apr 1-**91**, cost do. *El Rev Lond* Dec 13-**89**; E. Thomson, Mar 20 * 27, Apr 3 -**91**; cost from small power stations, Sep 30-**92**; cost various (38) Am. cities, table *El Rev* Mar 26-**92**; the Huntington arc projector *El Wld* * Dec 7-**89**; station, St. Louis (largest in world) report (full) Jan 3; use of arc in, E. Thomson (full) * Feb 28; 'Munic.' St. Louis system, Ayer, Sep 19-**91**; Westinghouse system, abs. *Inst C E* v 101 -**90** * *El Eng N. Y.* -**90**; cost, various cities *Sc Am Sup* Dec 14-**89**

ASHTON Court station, England *The Eng* * Dec 11, 11-**91**

ASSOC., Nat. pro. (full) *El Eng* Sep -**88**, Sep -**89**, (full) Mar, Mar, Aug 27-**90**, Feb 25, Montreal (full) Sep 16-**91**, Huntley addr. Mar 2-**92**, (full) *El Rev* Sep 8-**88**, (full) Mar 2, Niag. Falls, Aug 17-**89**, (full) Feb 22, Aug 30-**90**, (very full) Feb 28, Montreal, pors. * Sep 5, 19-**91**, pors. * Feb 20, (full) Mar 5-**92**, (full) *El Wld* Mar 3, Sep 8-**88**, (full) Mar 2, Aug 17-**89**, Kansas C. (very full) Feb 22, pors. * Aug 30-**90**, Pres. addr. (full) Feb 28, Montreal (very full) Sep 5-19-**91**, general hist. review, pors. (full) * Feb 27, Mar 5-**92**, *Sci Am* Mar 9-**89**, Prov. *St R J* Mar -**91**

Electric LIGHTING, BALL system *Sci Am* Feb 9-**89**
BANGOR, Me., Brush munic. plant *El Wld* June 29-**89**
BERLIN *El Rev Lond* July 19, 26-**89**; Kaiser gallerie *The Eng* Sep 21-**88**
BOSTON, Edison station (full) *El Eng* * Aug 10-**92**
BRADFORD, map *El Rev Lond* * June 10-**92**
BRIGHTON, Crompton report *El Rev Lond* Mar 7-**90**
BROOKLINE Gas Light Co., Mass., station *El Eng* * Mar 16-**92**
BROOKLYN, N. Y., Edison station, development, Field *El Eng* * Mar, *El Rev* * Mar 1, *El Wld* * Feb 22-**90**, (full) * Dec 21-**89**
BRUSH-Swan station effic. test, Bedell *El Wld* Sep 10-**92**
BUOYS, N. Y. harbor (cables) *El Rev* * Mar 12-**92**
CAMBRIDGE, England, station (full) *Eng* * Nov 4-**92**
CANCE system *Eng* July 19-**89**
CHELSEA, England, distrib. with accums., Webber (full) *El Rev Lond* * Oct 4-**89**
CHICAGO, Ill., Wash. Park, Scheffler *El Eng* * Nov 30-**92**; *Eng* * June 19-**91**
CINCINNATI, O., Hickenlooper station (working plan and el.) *El Wld* * Aug 24-**89**
CLINTON, Mass. station *El Eng* * May 20-**91**
CONDENSERS, future of, Swinburne *El Eng* * Jan 6; spark and air jet expts., E. Thomson * Feb 24-**92**. See also ELEC. condensers
DEPTFORD, Ferranti mains *El Eng* * July 9-**90**; alt. system *El Wld* * Dec 8-**88**
DOMESTIC, O'Keenan primary applic. to, Shedlock *El Wld* * July 7-**88**; plant test, Segundo, July 12-**90**, *Industries*. See also ELEC. Lamps, incand. — lighting, incand.
DUBLIN station *El Rev Lond* * Sep 16-**92**; *The Eng* Oct 2 -**91**
EASTON system *El Wld* * Nov 30-**89**
EDISON, pat. suit in England (full) *El Eng* June- Sep -**88**; station test, Hill (full) *El Rev Lond* Dec 21, 28-**88**; and Swan United Co. report, Aug 2-**89**, Aug 1-**90**, July 22; feeder and main pat. hearing, Aug 5-**92**; Edison Illum. Co's pro. *El Rev* Aug 24, *El Wld* Aug 24; Canada decis. (full) Mar 23-**89**; and Swan pats., legal decis. *The Eng* Dec 21-**88**; three-wire central station system * Nov 15, 22-**89**. See also ELEC. Co's, Edison; ELEC. lamps, incand, etc.

Electric LIGHTING, EIFFEL tower plant *Eng* * June 21, (full) *Sc Am Sup* * July 27-**89**

EMS, Imhoff, abs. *Inst C E* v 92 -**88**, *Central Elek* -**87**

ENGINES, high and low speed, Powers *El Eng* * July -**88**; Edison direct connected trip-expan. and generator * Apr 29-**91**; high speed in, Thurston *El Rev Lond* Aug 29, *El Wld* Aug 9-**90**; independent engines for incand. stations, Church * Mar 3, *El Rev* Feb 25-**88**; 1000 h.p., Berlin, inset *The Eng* * Apr 11, 11-**90**. See also ELEC. light stations; ENGINES

FERRANTI system, Haskins *El Eng* Feb 25, *El Wld* Feb 28 -**91**

FRANKFORT-on-Main *El Rev Lond* Feb 28 * Mar 7-21-**90**; exhib. May 29-**91**; report, abs. *Inst C E* v 100 -**90**, *Elek Zeit* v 5 -**90**; station, Miller report *The Eng* * Sep 30-**92**

GENEVA, Chavannes, abs. *Inst C E* v 95 -**89**, *Lum Elec* v 29 -**88**

HANOVER, Kohlrausch, report, abs. *Inst C E* v 100 -**90**, *Elek Zeit* v 5 -**90**

INCANDESCENT stations, independent engines for, Church *El Rev Lond* * Apr 13-**88**; prog. Böhm * Oct 9, 16, (full) *El Wld* * Sep 12-**91**; Ottawa, Ill. Valley plant, long dist., map *E News* * Oct 5-**89**; carbon filaments, Fitz-Gerald, n *The Eng* May 18-**88**; Adelphi theatre plant, Edison-Swan Co. * Jan 25-**89**. See also ELEC. lighting, London, etc. — stations

KESWICK water-power station, Fawcus *Eng* May 30, and discuss., inset *Inst C E* * v 102 -**90**

LIVERPOOL stations *El Rev Lond* Jan 30-**91**; license *E Rec* Sep 22, Oct 13, 27-**88**

LONDON *El Rev Lond* May, June 14, schemes, July, Aug -**89**; prog., Bailey (full) Dec 19-**90**; Elec. Supply Corp. report, Apr 1-**92**; prog., Bailey *El Wld* Jan 10-**91**; ed. *Eng* May 24-**89**; Pruden. Assur. Co. offices station * Feb 14-**90**; Naval exhib. * Nov 27 * Dec 11-25-**91** * Jan 1, 8-**92**; Lond. Supply Corp., Deptford *E & Min* Nov 10-**88**; *E News* July 4-**91**; Lond. Cen. station, Gilley *Soc Arts Mass* -**90**

The Eng Deptford incand. station, Lond. Elec. Supply Co. Oct 26-**88** * Apr 5, 12 * May 31; Kensington incand. station. House to House Elec. Sup. Co. * Feb 8-**89**; * Sep 5, 12 * Oct 24 * Nov 7 * Dec 5, 12, 26-**90**; Met. Sup. Co., map * Jan 16, 16 * 23 * Mar 6, Scotland Yard * May 8-**91**; St.

Electric LIGHTING, London
Pancras station, Regent's Park * Feb 19, 26; Notting Hill * Apr 15; Westminster Sup. Co. * May 13; * Sep 9-**92**
LOOMIS system *E News* * May 18-**89**
LOWELL light and power station, Shaw *El Eng* * Jan 14-**91**
MASSACHUSETTS statistics *El Wld* Mar 26-**92**
MELBOURNE exhibition, Murray *El Rev Lond* Nov 15-**89**
MOLDINGS, inset *El Eng* * Sep 10-**90**
MOTORS, trials *El Rev Lond* Feb 22, report *Eng* * Feb 22 * Mar 1-15, *F Inst* May -**89**, *J Soc Arts*
MUNICIPAL, Francisco *El Rev* Aug 30, *El Wld* Aug 30-**90**; Bangor, Me., plant, Brush, June 29-**89**; St. Louis 'Munic.' arc system, Ayer (full) Sep 19; by munic. authorities, H. Robinson *E News* Sep 12-**91**
NATICK, Mass., station *El Eng* * Aug 6-**90**
NEWCASTLE-on-Tyne Elec. Sup. Co. station, Heaviside *El Rev Lond* Oct 28-**92**
NEW York City, Edison 26th st. station, (full) *El Wld* * Jan 19-**89**; Madison Sq. Garden, Sullivan * Nov 14-**91**; * Jan 2-**92**
OXFORD station (full) *El Rev Lond* *July 8, *The Eng* *July 1-**92**
PARIS, exhib. '89 *El Rev Lond* Mar 29-**89**, Mar 21, 28, Apr 4, May 16, 23, 30-**90**; Sector of Place Clichy works * May * June 5-**91**; exhib., Heister system *El Wld* * Aug 24-**89**
Eng Palais Royal Edison station * Mar 8; exhib. * May 3, portable military plant, July 19, Oerlikon plant, 26, * Nov 15, 22-**89**
Inst C E Paris markets, Andra, abs. v 100 -**90**, *Genie Civil* * v 16 -**89**; station, Meyer, abs. *Inst C E* v 105 -**91**, *An Ponts* v 12 -**90**; Nansouty, abs. *Inst C E* v 108 -**92**, *Genie Civil* * v 20 -**91**; exhib., Fontaine *Sc Am Sup* * May 25 * Aug 17, Gramme station * Oct 19-**89**; Boul. Rich works, Lenoir * Jan 2-**92**
The Eng Paris exhib. * May 3-31 Oerlikon works * June 14, 21, T-H system * 28, station, July 26, Soc. Gramme do. Sep 20-**89**
PHILADELPHIA, Edison station *El Eng* * Oct 8-**90**, *Pwr* * May -**89**
PORTABLE plant *Eng* * Feb 10-**88**; light port. military, Paris exhib. July 19-**89**, do. Charlesworth *Sci Am* Nov 17-**88**, do. ap., Suez canal *The Eng* Oct 12-**88**

Electric LIGHTING, PROVIDENCE, R. I., Narragansett Co. station *El Eng* * Sep, (full) *El Rev* sup. * Aug 17, Henthorn (full) *El Wld* * Aug 17, *Pwr* * Oct -**89**, *St R J* * Aug -**90**

REGULATIONS, light and power service rules, Columbian exhib. *El Eng* Dec 28-**92**; station, safety *El Rev Lond* Jan 11-**89**; acts 1882 and 1888, Jan 10; (full) Oct 17-**90**; rules for work, Benjamin *El Rev* May 10; and motive power, for install. of, Boston Manuf'rs Mut. Ins. Co. Aug 23, do. *E News* Aug 9; ins. rules, com. report *El Rev* Aug 30, Sep 27, Jenks, 27, N. E. Ins. Exchange, Nov 8-**90**, do. *El Wld* Apr 21-**88**; rules, com. report, Sep 19-**91**; rules, for safe install. *E News* Aug 9-**90**, Oct 3-**91**; rules for *E Rec* Aug 16-**90**. See also ELEC. insurance regs.

ROPE gear for elec. light work, Booth, Lea *El Rev Lond* June 26-**91**

RULES. See ELECTRIC lighting regulations

SAFETY devices E. Thomson *El Eng* Mar, *El Wld* Feb 22-**90**; station safety regs. *El Rev Lond* Jan 11-**89**. See also ELEC. lighting regs.

ST. Brieux *El Wld* * May 16-**91**, *El Rev Lond*

ST. Catherine's Point light-house, most powerful light in world *Sc Am Sup* * July 21-**88**, *The Eng*

ST. Louis 'Munic.' arc system and station (largest in world) *El Rev Lond* Jan 16, report (full) *El Wld* Jan 3, Ayer (full) Sep 19-**91**

ST. Paul Gas Co. station *El Wld* * Feb 23-**89**

SALEM, Mass., T-H station *El Rev* * June 15, (plans) *El Wld* * June 15-**89** * Mar 15-**90** * Feb 14-**91**

SOPHIA City *El Rev Lond* June 17-**92**

SPERRY system *El Wld* * June 15-**89**

SPOKANE Falls station *El Wld* * Sep 13-**90**

STATIONS *Am C E* Edison incand., test of, Hill, and discuss. v 18 -**88**; *Cassier's* speed reg. of engines, Aldrich, May -**92** *El Eng* incand., independent engines for, Church, Mar -**88**; stats., U. S. Aug 20; value of detail in, DeCamp * 27-**90**; distrib. of steam from, Prentiss * Feb 25; central, management and finance, Foster, Apr 22, 29, May 6-20, June 3-24, July; op. by water power, Redman, Sep 16-**91**; fly-wheel accidents, Emery, Feb 10, 17; effic. and higher econ., Vail, Nov 23, 30, Dec 7; light and railroad plants op. from same station, M Cay, Dec 28-**92**

Electric LIGHTING STATIONS

El Rev Lond independent engines for, Church * Apr 13; transformers vs. accums., Crompton * Apr 20, 27, May 4; breakdowns, R. J. Jones * June 22; cost, Fritsche * Aug 31–**88**; cen., notes, Yeaman, Nov 21-**90**; materials * Mar 13; combining contin. and alt. cur. systems, Leonard, Oct 2, 9; how to get paying loads for, Marks, Dec 4-**91**

El Rev construction, Woodbury * Feb 22; econom. steam gen., Babcock, Mar 1; accounts system, T. C. Smith, Mar 1; insurance, Barton, May 31, July 19-**90**; building, Berlin Iron Bridge Co. * Jan 10; steam distrib. from, Prentiss, Feb 28; accounts, uniformity in method, Burleigh, sup. Sep 19; cen.. op. by water power, Redman, 19; how to get paying loads for, Marks, Nov 21-**91**; and power, Mackie, July 23, 30, Aug 13, 20, Sep 10-24, Oct 8, Nov 5, 12-**92**

El Wld accounts, T. C. Smith, Feb 22: Woodbury * 22: value of details in, DeCamp, Aug 30; as an investment, Sunny, Oct 25-**90**; steam distrib. from, Prentiss * Feb 28; uniformity in accounts, Burleigh, Sep 19; op. by water power, Redman, 19; how to get paying loads for, Marks, Nov 21-**91**; the lamp, manager and customer, Roberts * Mar 19: load curves * Feb 27-**92**, * *Electrician Lond*

E News Keswick, England, water power, inset * Sep 13-**90**; op. by water power *E Rec* Oct 10-**91**; running *Pwr* * Sep – Dec -**90** * Jan – Mar * Sep * Nov -**91**; hazards, Low *Sc Am Sup* Apr 9-**92**; stats. *St R J* Sep -**90**; Soc. L'Eclairage Elec., France *The Eng* * Nov 1-**89**; U. S., Addenbrooke, Jan 10, 24, 31-**90**; arc station management, June 24-**92**. See also ELEC. lighting, names of places

SUEZ canal, Sellon *El Rev Lond* * Sep 14-**88**

TAMWORTH, New So. Wales, Dymond *Inst C E* * v 108 -**92**

TESLA's system with curs. of high frequency *El Rev Lond* * July 17, *El Rev* * July 4-**91**

TIVOLI station *El Rev Lond* * July 15-**92**

TOPEKA, Kan., Kingman, discuss. *Am C E* v 26 -**92**

VENICE station *Eng* * Aug 14-**91**

WASHINGTON, U. S. Navy Yard, Brush arc station, Wilkes *El Eng* * May 21-**90**

WESTINGHOUSE alt. arc system *El Eng* * Apr 2-**90**; (full) *El Rev* and sup. * Oct 27, alt. stations (list) Nov 10-**88**; *Eng* * Feb 8, 22 * Mar 15-**89**; abs. *Inst C E* v 101 -**90**

Electric LIGHTING, WESTMINSTER Elec. Light Co. station *El Rev Lond* * Mar 18-**92**

WIRING leads cal., graphic method, Hering *El Eng* * May 27 -**91**. See also ELEC. wires

WORCESTER, Mass. station, Shaw *El Eng* * Dec 10-**90**

LOAD equalizer, Mailloux *El Rev Lond* * Dec 26-**90**

LOCK, electro-mag. permutation, Sedgwick's *El Rev* * Sep 28 -**89**

LOCOMOTION, Edison pat. *El Rev* * Oct 4-**90**

LOCOMOTIVES, Dobbie's gearless *El Eng* * June 10; Eickemeyer's gearless *El Rev* * June 13-**91**; proposed, Pellissier *El Wld* * Aug 6; tests, Siemens * 27-**92**; ed. *The Eng* June 13-**90**

LOG *El Rev Lond* * Jan 30-**91**

MACHINES, Wimhurst influence, Darke, cor. *Eng* * Feb 14-**90**, theory, Pellissier *Sc Am Sup* * Nov 14-**91**. See also ELEC. influence machine; DYNAMOS; ELEC. motors

MAGNETIC susceptibilities of various iron and steel, Niegbaur *El Eng* * Feb -**90**; reluctance, Kennelly (full) * Nov 4-**91**; propagation, E. Thomson, Wightmann *El Rev Lond* * Oct 26, do. *El Wld* * Oct 27-**88**; screening, variational, W. Thomson * May 9, do. *El Rev Lond* May 1-**91**; leakage, Ives * Jan 22, 29; balance, Du Bois * Sep 2, do. *El Wld* * Sep 24-**92**; non-magnetic balances and alloys, Haswell, Webb *El Rev* June 23 -**88**; field, change of form affecting, Dolbear, Mar 21-**91**; permeabilities of irons, Thompson * July 2-**92**; call and integraph, the Abdank *El Wld* * Nov 24-**88**; Eickemeyer's gauge * Nov 9-**89**; mag. circuit notes, Steinmetz, June 4; permeabil. of special irons, M. E. Thompson * 25; viscosity expts., Hopkinson * Oct 1-**92**; field, early conception, Houston *F Inst* Mar -**92**; circuit, theory, Collins *Tech Q* * May -**89**

MAGNETO-motive force and mag. formulas, Emery (full) *El Rev* * Aug 27 * Sep 3-**92**

MAGNETS, permanent, character of steel used for, Preece (full) *El Rev Lond* * Sep 12-**90**

MAGNETISM, relation to induced elec. mo. force and cur., E. Thomson (full) *El Wld* * June 1, *El Eng* * June -**89**; Hopkinson * Apr 9-30-**90**; twisting, Balch * Sep 14-**92**; in watches, Giles *El Rev Lond* * Oct 26, Gribi *El Rev* June 9, (full) *El Wld* * June 30-**88**; induced, Ewing * Oct 4, 11, *El Rev Lond* * Oct 3-**90**. See also MAGNETISM

Electric MAGNETIZATION, permeabil. of iron at right angles to direction of, Kennelly *El Eng* * June 11, 18-**90**; curves for, Emery * Dec 28-**92**; of iron, time-lag in, Ewing (full) *El Rev Lond* * Nov 8-**89**; changes produced by, in length of iron wires, Bidwell, Oct 14; of iron, electro-chem. effects, Andrews * Nov 25-**92**; formulas, Emery (full) *El Rev* * Aug 27 * Sep 3-**92**; of iron in very strong fields, Ewing *El Wld* Dec 22-**88**; curves of iron, under alt. curs., Moore * June 4-**92**; theory and formula for soft iron, Collins *Tech Q* * May -**89**

MEASUREMENTS, W. Thomson's instrums., Fleming *El Wld* * Feb 25, *El Eng* * May -**88**, by Weston high resist. voltmeter, Loomis * Dec 24-**90**, *El Rev Lond* * Jan 9-**91**; measuring ap. standardizing, Berlin, Aug 9-**89**; Anthony *El Rev* Jan 21; methods, Liebig, sup. Sep 8-**88**; wiping contact methods for cur. and poten., Thomas * July 30, *El Wld* * July 2-**92**; voltametric of alt. curs., Kennelly * Nov 3; in a house to house supply, Lowrie * 17-**88**; units and measures, Internat. conference, Paris (full) Sep 21-**89**; applics. of Weston voltmeters and ammeters, Maschke (full) * Mar 26 * Apr 2-23-**92**; Lowrie *Eng* Oct 5-**88**; Webb *E Mag* Oct; instrums., Swinburne *E News* Sep 15-29, (full) *Inst C E* * v 110-**92**, *The Eng* * May 6-**92**; as applied to commercial work, Anthony *F Inst* Jan -**88**; constant shunt method for large contin. curs., Pike * June -**92**; resist., Bauer *Pwr* * Mar -**92**

METERS *El Eng* Shallenberger's * Sep -**88**; Edison chem., Jenks (very full) * Jan -**89**; the Walker * Apr 9; Wood's * Dec 17-**90**; the Meylan-Rechniewski energy * Mar 18, Eickemeyer's differential magnetometer, Steinmetz * 25; alt. cur. potentiometer, Moler * May 27-**91**; Pilkington-White * Apr 13 -**92**

El Rev Lond Geyer-Bristol, for direct and alt. curs. * Dec 21, 28-**88**; Edison chem., Jenks, Jan 11 * 25, Feb 1, 8; for central stations, Forbes, Feb 1, 8; Cardew recording * Nov 15-**89**; com. report, Mar 28; Blathy alt. cur. * June 20; Thomson's * Aug 15; W. Thomson's * Oct 10; Mares' energy * Nov 7; Shand, Dec 5-**90**; Meylan-Rich. energy * Feb 13; Ferranti's * Mar 20; Frere's * 20-**91**; Brillie energy * Apr 29; Scott's * Dec 16, *The Eng* * Dec 16-**92**

El Rev for central stations, Forbes, Feb 16; the Slattery * Oct 12-**89**; Edison electrolytic, Kennelly * Oct 4-**90**; Walker, May 30, discuss. June 13-**91**

Electric METERS

El Wld Shallenberger's alt. cur. * Sep 15; Geyer-Bristol, for direct and alt. curs. * Nov 24; Reckenzaun & Pentz's * Dec 29-**88**; Edison chem., Jenks (full) * Jan 5; Nipkow's alt. cur. ammeter * Mar 9; E. Thomson's oscillating * May 4; the Walker * July 20; the Manwaren * Dec 7-**89**; the Walker * Apr 12, May 30, discuss. June 13; Shand, Nov 22-**90**; Perry's elec. supply * July 11-**91**

Inst C E for recording consumpt. of elec. energy, Wordingham, insets (full) * v 108-**92**; Mares' energy, Juppout, abs. v 103 -**91**. *Genie Civil* * 17-**90**; Hobart *Pwr* * June-Sep -**89**; the Wood ammeter *Sc Am Sup* * Jan 14-**88**; radiation meter, Gregory * Dec 14-**89**; * Jan 25-**90**; the Frager *The Eng* * May 29; the Teague * June 19-**91**. See also ELEC. ammeters—ohm — secoh — tele — volt — watt meters

MINING machinery, Atkinson *Eng* Feb 13, *E News* * Aug 8; energy transmiss., Leonard and ed. * May 16, Edison elec. percussion drill, 16; Aspen Min. & Smelting Co. * Oct 10-**91**

MOLDINGS, standard for elec. work *El Rev* * Nov 15-**90**

MOTIVE force, thermo-chem. relation to, Siebel *El Eng* July 9-**90**, relations to atomic wt., chem. heat, etc., Gore, *El Rev Lond* June 12-**91**, general relation to equiv. vol., Gore, June 3-24-**92**, constant with variable speed, Hoho *El Wld* * Jan 25-**90**, equation, for resist. and self-induc. circuit, Bedell (full) May 14-28, June 4-**92**; properties of the human heart, Waller * Nov 3, *Sc Am Sup* * Nov 24-**88**, *El Rev*; power, Thorenberg plant *Sci Am* Dec 1-**88**

MOTORS, *Am C E* comparative tests and st. locom., Manhattan eleva. R., Moss, and discuss., insets * v 23 -**90**

El Eng alt. cur., Duncan (full) * Mar, Mar; Liebig, Mar; designing, Walker, May; 2 h.p. Sprague, expts., Cox * June * Aug; alt. cur. and transformers, new system, Tesla (full) * June, June, Swinburne, Sep; service charges basis, Lufkin, Sep -**88**

El Eng diags., Clarke * Jan; regulation, Crocker * June; and dynamos, Perret * Aug; speed regulation, Deprez on, Paget * Aug; alt. cur. evolution, Patten * Oct -**89**

El Eng Swinburne's alt. cur. * Apr 16; Tesla's alt. * Aug 6; rates basis, Lufkin * 27; Tesla's new alt. Sep. 24; building, Short elec R. system * Oct 15; Bradley's alt. * Nov. 5, self-exciting * 12; windings, Serrell, Dec 10; Riker low speed multipolar contin. cur. * 17-**90**

Electric MOTORS

El Eng inventors of (Thomas Davenport) Pope (full) * Jan 7-28 * Feb 4; Patten's alt. * Mar 4 * May 13; alt. cur. design, Weston * Apr 1; perfection of stationary, Crocker * May 27; alt. cur., Hospitalier, Aug 26; op. at any speed or torque, with max effic., Leonard * Nov 25; law of max. effic., Mailloux, Dec 9; polyphasal generators, Pupin * 23-**91**

El Eng the Perret (full) * Jan 6; law of effic., Mailloux, Jan 13; alt. cur., Stanley * Mar 2; gearless, Short * Apr 13; Excelsior, Muldaur * Sep 14; Lundell fan * Dec 7-**92**

El Rev Lond simple * Apr 13; alt. cur., Tesla's new system * June 15, ed. 22 * 22-**88**; design, Snell, Feb 1; speed reg., Deprez, Apr 26, *Compt r;* regulation, Crocker *El Rev Lond* * June 14; alt. cur., evolution of new type, Patten (full) * Oct 11-**89**; armature reactions, theory, Swinburne * Feb 14, 21, Mar 28, Apr 4; op. with high tension curs., Sperry * Feb 21, 28; design, Esson * 28 * Mar 7, 14; Tesla's alt. * Aug 22, Oct 3-**90**; alt. cur. design, Weston * Apr 17; Hutin & Leblanc's alt. cur. * July 24; Edison's * Aug 21-**91**; leakage, Ives * Jan 22, 29-**92**

El Rev Liebig, Feb 25; alt. cur. and transformers, new system, Tesla * June 2, 9, Weyde * July 14: service charges basis, Lufkin, Sep 22-**88**; Bradley alt. cur. imps. * June 22; alt. cur. Patten * Sep 28-**89**; armature reactions, theory, Swinburne * Mar 15; imps. do. * Apr 19; Tesla's alt. cur. pats. * Aug 16; rates basis, Lufkin * 30-**90**; Eikemeyer's novel * Mar 28; Edison small slow speed * May 30; the perfection of stationary, Crocker * June 6; alt. cur., Hospitalier, Sep 12; Bradley's alt. cur. * Oct 2; perfect, Everett, 31; aut. op. at any speed or torque, Leonard * Nov 28-**91**; alt. cur., Stanley * Mar 12; Ryan series reg. test, Bliss, Dec 31-**92**, *Sib J Eng*

El Wld the Patten * Jan 7; effic. tests, Crane * Feb 4; alt. cur., Duncan (full) * 25; Liebig, Mar 3; reg., priority of invention, Sprague * Apr 7, 14; cal. and designing, Crocker * 28; alt. cur. and transformers, new system, Tesla * June 2; the Lugo * July 14; service charges, basis for cal., Lufkin * Sep 8; designing, Owens * Nov 17-**88**

El Wld alt. cur., Tesla, May 25; reg., Crocker (full) * June 1, discuss. * 8; the Perret * Feb 2, July 6 * Aug 3; alt. cur, ev. of new type, Patten (full) * Sep 28; Industries' prize, n * Dec 7; new prin. of constructing, Mailloux * 28-**89**

Electric MOTORS

El Wld relation to elec. lighting Co's, Fitzgerald * Feb 1; op. with high tension curs., Sperry, 15; design, Esson (full) * Mar 22, 29 * Apr 5, 12; the Zipernowsky-Deri-Blathy synchronous * Mar 29; Perret multipolar * July 26; alt. cur., new types * Aug 16; Van Depoele induction * 16; rates basis, Lufkin, diags. * 30-**90**

El Wld work of Dow, in torpedo service, Apr 18; alt. cur., Duncan * May 9, 16; perfection of stationary, Crocker * May 30, discuss. June 6; alt. cur., Hospitalier * Aug 29; Frankfort-Lauffen three-phase, Hering (full) * Oct 31 * Nov 7; aut. op. at any speed or torque, with max effic., Leonard * Nov 28-**91**

El Wld magnetic leakage, Ives (full) * Jan 2; alt. cur., Stanley (full) * Mar 5; alt. cur. self-starting and exciting synchronous, Patten * Apr 2; cal; Bedell, diag. * 30-**92**

Eng alt. cur., ed. Nov 20; the Short gearless *E News* * Sep 5-**91**; in workshops, Jenkin *Inst C E* * v 102 -**90**; small, effic., Clifford, abs. v 91-**88**, *Am Acad Arts & Sci* v 22-**87**; *E Rec* * Nov -**90**; cal., Bedell, inset *F Inst* * June -**92**

Pwr the Baxter * Dec -**88**; Thomson's * Jan; reciprocating * Feb -**89**; Simple * Jan -**90**; (various) * Jan -**92**, *Elec Industries;* (growth of business) Pope *R & Eng* Sep -**89**

Sc Am Sup the Menges thermo-mag, generator * Feb 18; simple, making, Hopkins * Apr 14; charges, basis for cal., Lufkin, Sep 22, Nov 3-**88**; the Tesla * Apr 6-**89**; home made, Parkhurst * Aug 2-**90**; small, Hopkins * Jan 3-**91**

St R J building, Short R. Co. * Oct -**90**; max. effic. conditions, Leonard, Mailloux, Jan-**92**; small, effic., Clifford *Tech Q* Sep -**87**, Feb **89**; small, comparative working expenses of, Korte *The Eng* Jan 22-**92**, *Zeit deut Ing* -**91**. See also DYNAMOS; ELEC. generators; RAILROADS, elec. motors

NAVIGATION, Bennett, *El Rev Lond* Apr 10-**91**.

OHM'S law, extension of elec. mo. force and Oudin *El Eng* Dec 30-**91**; expt. proof, Mayer * July 9, *El Rev Lond* Aug 1-**90**; units, the volt, ohm and ampere, Nipher * Apr 27, ohm det., Wuilleumier, July 13-**88**, suggestions, J. V. Jones (full) Sep 12; the Evershed *El Wld* * Jan 11-**90**; alt. cur., Swinburne * Dec 19-**91**; units, ohm, Glazebrook, Jones *Eng* Sep 26-**90**, new det. of *Sc Am Sup* * Feb 16-**89**; law and electro-therapeutics, Winton, July 26, expt. proof, Mayer * Aug 2-**90**, *Am J Sci.* See also ELEC. units

Electric OMNIBUS, London *Sc Am Sup* * Mar 2-**89**, *El Eng*
ORE-dressing, Tilly Foster mine, McDowell *E News* Oct 4-**90**
ORGAN, control, Hope-Jones *El Rev Lond* Jan 15-**92**; Wacker's action *El Wld* * Nov 23-**89**; organs, Swinburne * July 4-**91**
OSCILLATIONS, Hertz's researches, Tunzelmann *El Eng* Feb * Apr, May * July * Aug, Joubert * Oct -**89**; in air, Trowbridge *El Rev Lond* Oct 17, (full) *El Rev* * Dec 6-**90**
PARCEL exchange system, Bennett *El Rev Lond* * Sep 4, *Eng* * Sep 25-**91**
PATENTS, U. S. stats., Lockwood *El Eng* Feb -**88**; see *El Rev* files, especially 1890, progressive * Mar 26 * Apr 16 * June 4-**92**
PIPE bending *El Wld* * June 18-**92**
POLYPHONE, Zigang's *Sc Am Sup* * Oct 12-**89**
PORTELECTRIC Co's transport. system, N. E. *El Eng* * May 27, Pope report *El Rev Lond* June 5 *El Rev* * May 30-**91**, do. *El Wld* May 23-**91**, carrier * Oct 10-**90**
POTENTIAL, high, phenomena, Skinner *El Wld* * May 7; differences, Negbaur, Nov. 26, Dec 3, 10-**92**
POWER, elec. motor and st. locom. test, Manhat. eleva. R., Moss., insets *Am C E* * v 23 -**90**; distrib., Spaulding, insets *Cassier's* * Dec -**91**; and steam, Wright, Aug -**92**
El Eng standards of econ. in gen. of, Swetland * Aug 27-**90**; comparative cost, effic. of large and small motors, Wheeler, Apr 29; econom. limits of large units, Church * Dec 2, 9-**91**; Edison works, Schenectady, N. Y., Martin (full) * Feb 3; plant at Chic. World's fair, Collins * Mar 23-**92**; distrib. by alt. curs., Tobey *El Rev Lond* * Feb 5; distrib. by direct curs., Dow, 26-**92**; rates *El Rev* Aug 1-**91**
El Wld measurement by voltmeter, Swinburne * Apr 18; measurement of any elec. cur. to any circuit, Ayrton, Sumpner * May 2, 23; measurement developed by alt. curs. in any circuit, Hering * Dec 26; distrib. by alt. curs., Stanley * June 13-**91**, Leblanc *Lum Elec*
El Wld distrib. by direct curs., Dow, Feb 6; by alt. curs., Stanley, 6; Thomson's law of economy, Carter, July 30; station distrib., Unwin, Aug 20, 27; supply cost, Hopkinson, Dec 3, 10, 24; gen. at coal-fields and transmiss. to industrial centers, Thwaite * 31-**92**
Eng econom. limit of large units, Church, Jan 8; altruistic effects, Perrine *E Mag* Jan -**92**; technically considered, W.

Electric POWER

Allen *E News* * Nov 1-**90**; distrib., Spaulding *Pwr* * Dec -**91**, *Am M E*, *Sc Am Sup* Jan 16; gen. in coal-fields, Thwaite *The Eng* Dec 2-**92**. See also ELEC. motors; RAILROADS, elec. power stations

POWER Transmission, *Am Min* present status, Rothwell v 17 -**89**; in mining operations, Spaulding, insets (full) * v 19 -**91**

El Eng (energy) * Feb -**88**, *Industries;* Kapp *El Eng* Mar 25; at very high potens. * Apr 8; Leonard (full) Sep 2-**91**; long dist., Hart * Jan 13; high poten., E. Thomson, Mar 23; long dist., Scott * June 15-**92**

El Rev Lond Sprague, Mar 22 * 29, May 10; long dist., from over compounded gens., Serrell * Dec 6-**89**; Kapp, tables, Feb 20, Mar 6, (full) July 17 * Aug 7-28-**91**; Frankfort plan, Hering, Apr 8; multiphase and distrib., Reckenzaun, Apr 29 * May 13, June 24; long dist., Thwaite, Dec 16-**92**

El Rev Roberts * Aug 31-**89**; Kapp (full) Aug 8; long dist., Frankfort, alt. curs. differing in phase (rotary curs.), Dolivo-Dobrowolsky * Sep 19; Lauffen-Frankfort, Kapp * Oct 10-**91**; long dist., Hart * Jan 16; high poten., E. Thomson, Mar 26; long dist., Scott * June 25; by alt. curs., Kapp * Sep 17; future, Oct 15-**92**, Industries; *Electrician Lond*

El Wld long dist. cals., Serrell, table, May 25; Roberts * Aug 17; long dist., from over-compounded gens., Serrell * Nov 16-**89**; Mar 14; high pressure, at Oerlikon, May * Apr 18; Lauffen-Frankfort plant, Hering (full) * Sep 26 * Oct 31 * Nov 7; by alt. curs., Dolivo-Dob. * Oct 10-**91**

El Wld Lauffen-Frankfort tests, Hering, Jan 9, discuss. (full) Mar 5, effic. * July 2; diags., Schlesinger * Mar 5; Bell, 19; high poten., E. Thomson, 26; multiphase, Reckenzaun, May 21, June 11, July 23; long dist., Scott (full) * June 18; effect of harmonics on alt. cur., Rowland, Dec 10; gen. at the coal-fields and transmiss. to industrial centers, Thwaite * 31-**92**

Eng ed. Feb 20, 27, Mar 6-**91**; cost, Mansfield, n *E & Min* June 23-**88**; Rothwell, Jan 5-**89**; in the west, July 23-**92**, *El Eng;* Nevada mill *E News* Apr 12-**90**; alt. curs. for * Aug 22-**91**; Hering, Mar 19-**92**; Sprague *F Inst* * Mar -**89**; Lauffen-Frankfort, table, Aug; Griffin (full) Sep -**92**; by alt. curs., Stort abs. *Inst C E* v 106 -**91**; cost, Lahmeyer, v 109 -**92**, *Elek Zeit* -**91**-**92**; Geipel *Inst M E* Feb -**88**

Pwr long dist., Hart, Feb, Jackson, Apr, high poten., E.

Electric POWER Transmission
Thomson, May; Griffin * Oct -**92**; Morris *R & Eng* May -**92**; * Oct -**90**, *Genie Civil;* Sprague (full) *Sc Am Sup* * July 20, 27 * Aug 3-**89**; * Mar 3-**88**, *Industries;* long dist., Hart *Tech Q* * Apr -**92**; Kriegstettin to Solothurn, expts. *The Eng* Apr 13-**88**; West, Jan 16; Lauffen-Frankfort install. * Oct 2, 9, oerlikon alternator * 23-**91**. See also RAILROADS, elec. power stations

PROJECTILES, elec. welded, Maxim *Cassier's* * Oct, *El Rev* Aug 6-**92**

PUMPS, pumping in collieries, Brain *El Eng* Jan -**88**; Dittman's vac. *El Wld* * June 4-**92**; Hall's pumping plant *E News* May 5-**88** * Mar 15-**90**; three-cyl. elec., Gould Mf'g Co. * Nov 14 -**91**

RAILROADS, elec. working of, W. E. Hall *E News* July 12, limitations of steam and electricity in transport. 12-**90**. See also RAILROADS, elec.

RECORDING instrums., Holden, Drake and Gorham's *El Rev Lond* * Sep 30-**92**

REGISTER, Ongley *El Rev* * Jan 31-**91**

REGULATORS, Herrick *El Wld* * Apr 5-**90**

RESISTANCE, *El Eng* compensated standards, Nichols * June -**88**; specific, of paper * June; of elec. light installs., Jamieson, Oct -**89**; specific, of metals and alloys, Prescott, Apr 30, May 7; inductive det., Steinmetz, Oct 29, Nov 5-**90**; insul., measuring, Patterson * May 20; of copper, standard for, Holman, Nov 18; compensating, for galv. shunts, Frey * Dec 23-**91**; standards, Willyoung, June 1; insul., of cotton and silk covered wires, Luquee * Dec 28-**92**

El Rev Lond compensated standards, Nichols, Aug 10-**88**; insul., of elec. lighting station, Jamieson, Jan 25; standard, design, Fleming * Feb 1-**89**; of mercury, Glazebrook, Sep 19; spec., of copper, Fitzpatrick (full) 26; of metals, Le Chatelier * Oct 17; wire standard resists. Dec 26-**90**; human body, value of diminished, Cardew, Mar 13; of conductors, measurement, Appleyard * Dec 18-**91**; of pure metals, alloys, Nov 11-**92**; of mercury, det., Glazebrook *El Rev* * Oct 18 -**90**

El Wld compensated standards, Nichols, June **9-88**; of iron and its alloys at high temps. * Apr 19; of mercury, det., Glazebrook, Oct 11; wire standard resists., com. report, Dec 6;

Electric RESISTANCE
coils and boxes, Frey * 20 * 27-**90** * Jan 3, 10; coils, alloys for, Feussner, Mar 14-**91**; non-inductive construction, Ayrton, Mather * Feb 13; of parallel circuits, Bedell * Oct 15-**92** *F Inst* Megohm, Davids, Apr -**91**; standards, manuf. and adjustment, Willyoung, Apr -**92**; of metals, steel, Le Chatelier, abs. *Inst C E* v 104 -**91**, *Compt r* v 111 -**90**, 112 -**91**; of pure metals alloys *Sc Am Sup* * Dec 31-**92**. See also under ELEC. insulation
RETARDATION due to iron pipes, Preece *El Wld* May 21-**92**
RHEOSTAT, new, C. E. Carpenter *El Rev* * Nov 5-**92**
ROUTING machine, Irish's *El Wld* * Nov 2-**89**
RULES, fire ins., Hartwell (full) *El Rev Lond* Sep 12-**90**; right hand and other rules, Maycock * Jan 15-**92**; elec. light ins. rules, England *El Rev* Jan 14-**88**. See also ELEC. insurance rules — lighting regs.
SAFETY devices, E. Thomson *El Rev Lond* Mar 14, *El Rev* Feb 22-**90**. See also ELEC. insurance
SCHISEOPHONE (flaws in metals) *El Eng* * July 16-**90**
SCREENING, electrostatic, by gratings, etc., W. Thomson *El Rev Lond* Apr. 17; and magnetic, variational, do. *Sci Am Sup* * May 16-**91**
SEARCH light, Hutchins *Cassier's* * Dec, Knowles (full) *El Eng* * July 27 * Aug 3, 24-**92**
SECOHMETER, Ayrton & Perry's *El Rev* * Apr 20-**89**
SECRET service, individual telegraph call *R Gaz* * Aug 28-**91**
SEEING to a distance, Weiller, cor. *Sc Am Sup* * Feb 8-**90**, *Genie Civil* v 15, *Lum Elec*, *El Rev*
SEWAGE purification, Gilley *Soc Arts Mass* -**90**
SHUNT, constant method, errors in, Puffer *El Rev Lond* May 11-**88**
SIGNAL ap., Morgan's aut. system *El Rev* * June 7, *Eng* * May 16-**90**
SMELTING and production of aluminum, Boby *Sc Am Sup* * July 13-**89**. See also ALUMINUM
SNOW sweeper, General Elec. Co. *Sc Am Sup* * Dec 31-**92**
SOLENOIDS, properties, S. P. Thompson *El Rev* Feb 21-**92**; variable action of two-coil, Aldrich *F Inst* * Apr -**92**
SPARKS, nature, in elec. vibrations of Hertz, Bischoff *El Rev Lond* * Sep 25, Oct 2-**91**; sparking, Serrell *El Wld* * Nov 10-**88**

Electric STANDARDS, com. report *El Rev Lond* Sep 26, Oct 10-**90**; Oct 16, discuss. 30-**91**; Pellet report, Sep 13, 20, *El Wld* Sep 7-**89**; com. report, Sep 26-**91**; Brit. Assoc. Sep 3-**92**; com. report *El Rev* Oct 3-**91**, *The Eng* sup. Dec 9-**92**. See also ELEC units

STOCKS, English, table *El Rev Lond* Dec 16-**92**; market *El Wld* Dec 6-27-**90**

STORAGE, of the alt. cur., Foppl, abs. *Inst C E* v 102 -**90** * *Elek Zeit* -**90**; storage batteries. See STORAGE bats.

STORM phenomena *El Eng* * Aug 24-**92**

STOVE, Giraud's thermo-elec., Hospitalier, abs. *Inst C E* v 105, 106 -**91**, *Genie Civil* * v 19 -**91**, *Sc Am Sup* * July 18 -**91**. See also ELEC. heating

STRESS, optical demonstration of, Rücker *Eng* * May 18, *Sc Am Sup* * May 19-**88**

SUBWAYS, N. Y. Bd. of Elec. Control, report *El Wld* Jan 12-**89**, Jan 25; practical working, Maver, discuss. Mar 15-**90**; of N. Y. City *E News* Apr 21 * May 5, 26; of Phila., cor. * June 9-**88**; of N. Y. *Sci Am* Apr 20-**89**. See also ELEC. wires, underground

SUGAR refining *E News* Sep 22-**88**

SUPPLY, cost, Hopkinson *El Rev Lond* Nov 11-**92**. See also under ELEC. lighting

SWITCH-boards, Manhattan Elec. L. Co. *El Rev* * May 7; multiple, Baylis, July 9-**92**

SWITCHES, designing, Offrell *El Wld* June 21-**90**; and switching *Pwr* * June * July -**91**

TABULATING, Hollerith system, com. report *F Inst* * Apr -**90**. See also CENSUS counting ap.

TANNING *El Rev Lond* June 26 * July 3, 10-**91**, *El Rev* June 14, hist. n *El Wld* Sep 27-**90**

TELEMETER system *E News* Oct 5-**89**; Fiske's (marine dist. instrum.) Brylinski abs. *Inst C E* v 106 -**91** * *An Telegr.* -**91**

TERMS and phrases, Maycock *El Rev Lond* * Mar 25-**92**; (list) *E Rec* June 2-**88**

TESTING, Handbook of, Kempe, bk., Spon; of iron, Swinburne *El Wld* * Sep 27-**90**; ap., construct. and use, Frey * Jan 17-31 * Feb 7-28 * Mar 7, 14-**91**

TIME. See TIME, electric

TRACTION, de Coetlogon *E News* * Aug 18-**88**; the Ries increaser (locomotive) * Aug 9-**90**

Electric TRANSFER table, Sprague, Altoona, Pa. *El Wld* * Apr 13; Fitchburg, Mass. * Nov 16-**89**

TRANSFORMATION, alt. – direct cur., proposed system, Patten *El Wld* * Feb 27 * Mar 19-**92**

TRANSFORMERS *El Eng* alt. cur., Kapp, discuss. (full) * Apr, Apr, new system, Tesla (full) * June, and contin. cur. system, comparative value, Badt, July, Swinburne, Sep -**88**; Ryan, and discuss. (full) * Jan, Jan; effic., Humphrey * July 2-**90**; distrib., Swinburne * Apr 1, 8; alt. cur., geomet. theory of, Steinmetz, June 3-24, July 1-29, Aug 5 - Dec 23-**91**; relation of size and effic., Stillwell, Mar 2-**92**

El Rev Lond alt. cur., Kapp (very full) * Feb 17, distrib. by, Mackenzie * 17, 24, Mar 2, 9, Crompton * Apr 20, 27, May 25; new system, Tesla * June 15, 22, ed. 22; distrib. by, Gutmann, Oct 26; (secondary generator) pats., Gaulard & Gibbs vs. Ferranti, July 13-**88**, Mar 8; Ryan * Jan 17; reg. cur. or poten., E. Thomson's method * Apr 26; hist., Wilking's, Gelyi, May 17, 24; losses due to hysteresis in, discuss., E. Thomson, Tesla, June 13; description, Swinburne (full) Sep 20; Picou, report, 20-**89**

El Rev Lond distrib., Swinburne, Feb 27, Mar 6, 20; effic., Stanley, Mar 6, 13-**91**; relation of size and effic., Stillwell, Apr 22; distrib. by alt. curs., Kennedy, 22, May 6 * 20 * 27; hist. of tension-reducing * May 27; Perry, June 3; tests, Hopkinson report (full) * July 1; effic. at different frequencies, Ayrton, Sumpner * Sep 23, imps. * 23; alt. cur., expts., Fleming (full) * Dec 2-30; Ferranti (full) 30-**92**

El Rev new system, Tesla * June 2-**88**; Ryan, Dec 28-**89**; effic., Humphrey (full) * July 5-**90**; German cur. * June 20-**91**; relation of size and effic., Stillwell, Mar 5; 17,500 watt, test report, diag. Oct 1-**92**

El Wld alt. cur., Kapp * Mar 17, 24; contin. cur., Sellon * May 5; new system, Tesla * June 2; points in distrib. by Gutmann * Oct 13-**88**

El Wld E. Thomson's method of reg. cur. or poten. in secondaries of * Apr 13; Kapp regulating * May 4; and Ganz alt. machine, Forbes * 25; Picou, Sep 7; Paget's alt. cur. * Nov 16; tests, Ryan (full) * Dec 28; design of commercial, Swinburne, 28-**89** * Jan 11, 25, Ryan, discuss. 11; effic., Humphrey (full) * July 5; distrib. by, from cen. and eccen. stations, Ganz system, Fleming (full) 26 * Aug 2-30, Sep 6 * Oct 25 *

Electric TRANSFORMERS

Nov 1-15, 29 * Dec 6, 27-**90** * Jan 10, 24, 31 * Feb 14; mag. circuit of, closed or open, Evershed, Mar 21 * 28 * Apr 4, 18, 25 * May 2, 9, 23 * June 6; distrib., Swinburne * Mar 21, 28 * Apr 4, 11-**91**

El Wld relation of size and effic., Stillwell, Mar 5; effic., Dobrowolsky * May 28; the Rowland, July 9; Westinghouse 6,500 watt, test, Hopkinson * 16, 23; test of 17,500 watt Stanley, Ryan * Oct 1; effic. at different frequencies, Ayrton, Sumpner * 8, 15; hysteresis measurement in, Evershed * 15, 22; universal, Appolonj * Dec 10; alt. cur. expts., Fleming * 24-**92**

Eng pats., ed. Mar 8-**89**; interference with alt. curs., Ayrton, Mar 27-**91**; Haskin's, bk. n *E News* Sep 29-**92**; alt. cur., Kapp *The Eng* Feb 10-24-**88**; alt. cur., Fleming, bk. review, Aug 26-**92**

TREE felling machine *Sc Am Sup* * Mar **2-89**, *Industries*

UNDULATIONS, Hertz's expts., Bertolini *Eng* * Dec 12-**90**. See also ELEC., Hertz's

UNITS, Crocker *El Eng* Dec 31-**90**; Brit. Assoc. Oct. 14-**91**; the volt, ohm and ampere, Nipher *El Rev Lond* * Apr 27; ohm det., Wuilleumier, July 13; nomen. Dec 7-**88**; and standards, Pellet report, Sep 13, 20-**89**; com. report, Sep 26, Oct 10-**90**; of measurement, absolute, Moon, May 1; and standards, report, Oct 16, discuss. 30-**91**; nomen., Lodge, Aug 12-26-**92**; Crocker *El Rev* Jan 3; and standards, report, Oct 3-**91**

El Wld the volt, ohm and ampere, Nipher, Apr 7-**88**; standards, Pellet, Sep 7, and measures, Internat. Elec. Con., Paris (full) 21-**89**; of present and future, Crocker, Jan 3; Kimball (full) * 17-31; and mag., absolute dimens., Rodgers, May 2; and standards, com. report, Sep 26-**91**; do. Brit. Assoc. Sep. 8-**92**

Eng ohm, Glazebrook, Jones, Sep 26-**90**; new det. of ohm *Sc Am Sup* * Feb 16-**89**; of present and future, Crocker, Apr 11-**91**; (terms) *St R J* Oct-**89**; and mechan. *E & Min* Aug 9, *The Eng* July 4-**90**; electro-magnetic, Nov 27-**91**; standards, com. report, sup. Dec 9-**92**. See also ELEC. ampere — ohm — standards — volt — watt, etc.

VACUUM discharge streamers action, Pupin *El Eng* * Apr 20-**92**; tube discharge, Tesla *El Wld?* June 10 * July 1-**91**

Electric VOLTMETERS *El Eng* the copper, Anderson, Oct -**88**; spiral coil, Ryan * Dec -**89**; best dimens. for standard, Kennelly, Nov 12, 19-**90**; Weston direct reading alt. and contin. cur. * Dec 16-**91**

El Rev Lond portable, for measuring alt. poten. differences, Ayrton (full) * Jan 13-27-**88**; Ayrton & Perry's hot wire * Mar 8; spiral coil, Ryan * June 28; W. Thomson's chain of electrostatic, Meikle * Nov 8-29-**89**; Ayrton & Perry's twisted strip * May 2-**90**; Sankey * Nov 27, Dec 4-**91**; Weston's * Jan 1-**92**

El Wld for measuring alt. poten. differences, Ayrton, Perry * Jan 28, Feb 4, 11; portable, do. Mar 10; Weston's * Nov 17-**88** * Feb 2; instrums. for measuring high potens. * 9; Ayrton & Perry's * Apr 6; spiral coil, Ryan * June 1-**89**; Ayrton & P's twisted strip * May 24-**90**; Weston, as a testing instrum., Merrill * May 21-**92**; and ammeter combination, A. White (full) * *Soc Arts Mass* -**90**

WATER conveyor, Bailey's, n *El Rev* * Aug 2-**90**; purification, Stanley-Quackenboss pat. *E News* May 17-**90**

WATTMETERS, Thomson recording *El Eng* * Nov 5-**90** * June 17-**91**; corrections to readings, Danielson *El Wld* * Mar 5, do. Friese, do. May 21-**92**; for alt. curs., Ganz *Eng* * Apr 5-**89**; abs. *Inst C E* v 94 -**88**, *Cen Elek* -**88**

WAVE and phase indicator, for alt. and undul. curs., E. Thomson *El Rev Lond* * Feb 3-**88**; waves, mechan. actions, Hertz *El Wld* * July 25-**91**; propagation through wires, Hertz * Oct 12, *El Eng* Dec, (full) *Sc Am Sup* Oct 19-**89**

WEIGHING machine, the Snelgrove *El Rev Lond* * Aug 16, *El Rev* Sep 7, *Eng* * June 21-**89**

WELDING *Am M E* Woodbury v 10 -**89**; *Am Min* E. Thomson v 19-**91**; and metal working, Wood, v 20 -**92**; *Cassier's* welded projectiles, Maxim * Oct -**92**

El Eng aut. machines, Lemp (full) * June 4; E. Thomson, Oct 8-**90**; practical aspects, Perrine, May 27-**91**; *El Rev Lond* * Jan 6; E. Thomson * Nov 16-**88**; Benardos system, Jan 1-**92**; proc., Lodge on, Varley (full) July 18, *Industries* June 27-**90**

El Rev Woodbury, Oct 27, tests, table, Nov 3-**88**; aut. machines, Lemp (full) June 7; applied to manuf. of projectiles, Wood, Nov 1-**90**; practical aspects, Perrine, May 30, discuss. June 13; Okonite Co's plant * Oct 24-**91**, welded projectiles. Maxim, Aug 6-**92**

Electric WELDING

El Wld Benardos', by means of the arc * Feb 25; tests, table, Dec 1-**88**; Thomson's * Feb 9-**89**; aut. machines, Lemp (full) * June 7; Coffin's incand., new method * Sep 20; E. Thomson, Oct 11; in projectile manuf., Wood, Nov 15-**90**; pract. aspects, Perrine, May 30, E. Thomson, June 6-**91**; Benardos' system, by elec. arc * Jan 16; in wire indus., Bullard, abs. Mar 12; and metal working, Royce, Nov 12-**92**

Eng Benardos' system * Dec 25-**91**, do. St. Petersburg * Jan 27; Thomson's * Dec 14-**88**, do. Fish, Oct 4-**89**; *E Mag* Pope * July -**91**; *E & Min* Thomson's, n * Nov 17-**88** * Feb 9; Howe's Metallurgy of Steel (bk.) sup. May 11-**89**; arc * Sep 13; aut. machine, Lemp * Nov 29-**90**

E News Benardos' method, Apr 7; proc. * May 5-**88**; Thomson proc., expts. Mar 9, 23; fibrous structure of elec. welds * Sep 14, 21-**89**; Fish, Jan 18; (full) * Nov 15-**90**; pract. aspects, Perrine, June 6-**91**; *E Rec* Woodbury, Nov 17 -**88**

F Inst Woodbury, Dec; Thomson * Nov -**88**, Thom. Elec. Welding Co., U. S. Naval Bd. report, July; Thomson's, notes from Paris exhib., Hering, Sep -**90**; *Inst C E* applic. of electricity to welding, stamping and other cognate purposes, Bramwell, and discuss. (very full) * v 102-**90**, pract. aspects, Perrine, abs. v 105-**91**, 107-**92**, *Am Inst Elec Engrs* -**91**; of metals *Locom* Nov -**88**; Benardos' method, Ruhlmann *R & Eng* * Feb -**88**, *Electrician Lond*

R Gaz Woodbury, and discuss., abs. Nov. 2-**88**; wire cable, Stuart, Bullard, July 19; of rails, Ries, cor. Sep 27-**89**; of projectiles, Wood, Nov 7-**90**; cost, May 1; uses, Perrine, 29, E. Thomson, discuss. June 12-**91**; elec. blow-pipe, Sheldon *Sci Am* Feb 2-**89**

Sc Am Sup Benardos' * Mar 3; applics., Stuart, July 21, Oct 20-**88**; Thomson's * Jan 26-**89**; weldable by electricity (list) n Aug 16; prog. * Sep 20; of projectiles, Wood, Nov 22, 29-**90**; Dewey * Jan 17-**91**; Benardos-Howard proc. * Feb 6-**92**; *Soc Arts Mass* of projectiles, Wood -**91**

The Eng Thomson's machines, Paris exhib. July 5-**89**; ed. Feb 21, cost, n 28; Bramwell, Apr 18; Woodbury, June 27; arc C. L. Coffin, n * Sep 12; of projectiles, Wood, Dec 5 -**90**; Benardos-Howard proc. * Dec 25-**91**, machine * Feb 26 -**92**

Electric WINDING coils data, table, Wheeler, *El Eng* May -**88**; the Bell compound, for constant poten. *El Wld* * Nov 29-**90**, do. abs. *Inst C E* v 103 -**91**, *El Eng* v 10 -**90**

WINDLASS *El Rev Lond* * July 3-**91**

WIRE covering machine, Barraclough's *El Rev Lond* * Mar 14-**90**

WIRES *El Eng* Brackett addr. Feb -**89**; tests, Paris exhib., Hering, May 14; Kerite insul. manuf. * Nov 12; insul. and cables testing, Webb * 19, 26 * Dec 3-31-**90** * Jan 7-28 * Feb 4-18 * Mar 4-18; cop., temp. correction for, Hering, Jan 7; temp. coeffs. det. of german silver, Sheldon * June 10-**91**; overhead construction, Peck * Mar 2-**92**

El Rev Lond overhead vs. underground, Wheeler, Nov 2; sizes, table, 16; lead covered cables, ed. Dec 28-**88**; overhead (mechan. strains) S. Russell, Oct 24-**90**; *El Rev* Brackett addr. (full) Jan 12; disruptive discharges in lead cables, Rudd * Mar 9-**89**

El Wld rules for overhead conductors, N. Y. Bd. Elec. Control, Dec 8-**88**; Cobb vulcanite manuf. * Jan 5; Am. insul., tests, Wilkes (full) * 26, Feb 9; disruption discharges in lead cables, Rudd * Mar 2-**89**; insul., commercial measurement of, Hering * Mar 7; large compounded, table, do. 28; cable testing, Fisher * June 27 * July 4-18-**91**; overhead construction, Peck * Mar 5-**92**; do. vs. underground, Webb *E Mag* Aug -**91**; Johnson Interior Conduit and Insul. Co. system, com. report *F Inst* * Mar -**91**

UNDERGROUND *El Eng* undergrounding of arc, Leggett, Mar; N. Y., Wheeler, Sep; disruptive discharges relation to, Acheson * Sep -**88**; com. report, Mar -**89**; N. Y. subways practical working, Maver (full) Mar; high tension, English authorities on, Apr 2; Edison tubes system * July 2-**90**

El Rev Lond system, Brooks * Feb 3; N. Y. vs. overhead, Wheeler, Nov 2-**88**; District Columbia, U. S. Mar 22; Verity, Apr 26; N. Y., Bd. Elec. Control report, Jan 25, Wheeler, May 3-**89**; Brooklyn subways, com. report, Jan 24, 31, Feb 7-21-**90**; cables, S. A. Russell * Mar 13, 20-**91**

El Rev arc light, Leggett, Mar 3, 3; N. Y. Bd. Elec. Control (full) July 28; disrupt. discharges relation to, Acheson, sup. * Sep 8; and overhead, Wheeler * 15-**88**; Brooklyn commission report, Jan 5; Johnstone conduit system * Feb 23, 23; com. report, Mar 2; N. Y. arc, Wheeler, Apr 20-**89**;

Electric WIRES, Uunderground

Brooklyn subways report (full) Jan 4-**90**; construction * Mar 5-**92**

El Wld Brooks system * Jan 21; disrupt. discharges relation to, Acheson * Sep 8; and overhead, N. Y., Wheeler (full) 8-**88**; conduits, com. report, discuss. (full) Mar 2-**89**; N. Y. subways, Maver (full) * Mar 1; Munsie-Coles conduit system * June 14; Edison tubes system * July 5; conduits, com. report, Aug 30-**90**; construct. and maintenance, Fowler, Sep 5-**91**; and discuss., Francisco, Mar 5; N. Y. city * Apr 23-**92**

Eng Waring's cables * Oct 19-**88**; Paris mains * Jan 30 * Feb 6-27-**91**; vs. overhead, Webb *E Mag* Aug -**91**; N. Y. subways *E News* Apr 21 * May 5-26; Phila. June 9-**88**; Paris * Jan 25-**90**; Washington, D. C., Elec. Commission report, Nov. 7-**91**; N. Y. Bd. Elec. Control report *E Rec* * Jan 14-**88**; Europe *R & Eng* * May -**90**; number in various cities *Sci Am* Dec 1-**88**; cables, W. Siemens (full) *Sc Am Sup* Aug 10-**89**; construct., Fowler, Sep 26-**91**

WIRING chart, Waring *El Eng* * Oct 8-**90**; and ins. rules, N. E., com. report, Sep 16-**91**; of buildings, Andrews *El Rev Lond* Apr 5-**89**; Andrew's concentric system * May 15-**91**; houses, Segundo, Jan 1 * 8, 29-**92**; leads for, graph. method of cal., Hering *El Rev* * May 30, do. *El Wld* * May 30-**91**; of buildings, standard rules, Crockett, Apr 20; Colonnade hotel, Phila. May 11; Interior Elec. Conduit Co. system * Nov 30-**89**; diag. for cal. length of wire *E News* July 11 * Sep 12; safe rules, com. report *E Rec* Oct 10; kinks, Francis *Pwr* * Aug; safe, Elec. Light Assoc. report (full) Oct -**91**; spec., Lond. *Sc Am Sup* Oct 13-**88**; of buildings, Andrews * May 25-**89**, *El Eng Lond*

WORLD offices, N. Y. *El Wld* * Jan 11-**90**

Electricians, eminent, facts, Weyde *El Rev* Nov 14-28, Dec 5, 19-**91**, Jan 16, 23-**92**; the electrician in war, Fiske *El Wld* Nov 1-**90**

Electricity, Modern, Kirwan, bk., Boston, 1889; and haulage, Pocock *Am Min* v 18 -**90**; *El Eng* Brit. Assoc. papers, Lodge, Nov -**88**; Paris exhibits, Hering * May 14, 21 June 26; dangers, Morton, Aug 27-**90**; in transitu from plenum to vacuum, Crookes * Feb 4-18-**91**; magneto-electric. discovery. America's part in, work of Farraday and Henry * Jan 13, 20 * Feb 3-17 * Mar 9-**92**

Electricity

El Rev Lond in Gynæcology, Burton, Nov 1-**89**; ether and matter, Gray * Feb 13, 27; in relation to human body, Lawrence, Mar 27, Apr 3-**91**, human body as a conductor of, do. Aug. 12, action of alt. curs. on, Korthals, Oct 14; for curative purposes, Aug, Sep, ed. 23-**92**

El Rev and light, identity of, Hertz, Dec 14-**89**; dangers of, Morton, Aug 30; in daily life, bk. review * Dec 27-**90**; in transitu from plenum to vac., Crookes (full) * Feb 14; history (Leyden jar), 150 years ago, Weyde * Oct 17, 24 * Nov 21 * Dec 12-**91**; radiation of energy, Trouton, Mar 19; correlation of with heat, Preston, Apr 2; mod. views, Stanley, 16; what it is Jacques, May 21; medical, files Sep-Dec -**92**

El Wld thermo-electricity, Acheson * Feb 25-**88**, do. Rust * July 27 * Aug 3, 10-**89**; dangers of, Morton, Aug 30; the electrician in war, Fiske, Nov 1-**90**; in transitu from plenum to vac., Crookes (full) * Feb 7-21; as the rival of steam, Bell (full) Mar 14; electric., galvanism, magnetism and the telegraph, chronol. hist., Mottelay (very full) * Apr 18- * Oct 24, Nov 7 - Dec 26-**91**, Sep 3, pors. * 10 - * Oct 22 - Dec 31-**92**, etc.; elements of practical, Bell (full) * Sep 5, 12, 26 * Oct 3 - Dec 26-**91**; * Jan 2 - * Feb 20, Mar 12; Buffalo features, Hering (full) * Feb 13; at World's Columb. exhib. Aug 20, 27, Sep 3, 17, Oct 8, 22 * Nov 5, 26 * Dec 24, 31-**92**

Eng as applied to eng., Geipel, Feb 17, 24-**88**; and gas, comparative cost, ed. July 10; chronol. hist. of, Mottelay, June 5, 12, 19, July 3, 17, 24, Aug 7, 14, 28, Oct 2, 16, Nov 13, Dec 11-25-**91**, Jan 8-22, Feb 5, 26, Mar 4-**92**; and gas, relative cost, Humphreys *E Mag* Nov -**92**

E News from water power, Belknap water motor and dynamo * June 15; a decade of prog. in, July 27-**89**; heat production from, ed. Aug 9; dangers of, Morton, Sep 6; in warfare, Fiske * 20, 27-**90**; as a mode of motion, Kropotkin * June 30-**92**

F Inst mod. conceptions of, Duncan, Aug; in warfare, Fiske, Sep -**90**; its past, present and future, Pope, Jan; events, chronol. Feb; as the rival of steam, Bell, Mar -**91**; applics., lectures (bk.) *Inst C E* -**84**; as applied to eng., Geipel, and discuss., insets (full) *Inst M E* * Feb -**88**; possibilities of, W. Crookes (suggestive) *Littell's* Apr 9-**92**, *Fortnightly Rev;* recent science, Kropotkin (nature) 19*th Cent* May -**92**; lessons *Pwr* files * Jan -**91** etc; latest discov., Gordon *R & Eng* June -**92**

Electricity

Sc Am Sup position and prospects as applied to eng., Geipel (full) Mar 10, 17; applics., Preece (full) Sep 29-**88**; light and heat, Brackett, Feb 2, 9; in the engine room * Dec 14-**89**; in warfare, Fiske, Sep 20, 27-**90**; in transitu from plenum and vac., Crookes (full) * Mar 7, 28-**91**; what it is, expts., Jacques, June 4; commercial, Spaulding *Tech Q* Apr -**92**. See also under ELEC. eng; ELECTRO-

Electro-culture (plants), report (full) *El Rev* * Oct 17-**91**

Electrocution, of Kemmler, Talbot *El Rev* Apr 25-**91**; Heinrichs *Sc Am Sup* Aug 10-**89**. See also ELEC. execution

Electro-deposition, arr. of vats in, Mailloux *El Eng* Jan 14-28; Wilkes, Feb 11-**91**; of platinum, Wahl, July 16, *El Rev Lond* July 11, *El Wld* June 28-**90**

Electro-dynamic machinery, theoret. elements of, Kennelly *El Eng* * July 6, 20 * Aug 3, 31, Sep 7-**92**; actions, speed of diffusion, Hertz *El Rev Lond* Nov 9, 16-**88**; dynamics of stationary bodies, do. *El Wld* Sep 20, 27, Oct 18, 25, Nov 8, 15 -**90**, *Electric Lond*; force produced by dielectric in elec. field, Röntgen, abs. *Inst C E* v 92 -**88**, *Sitzung Akad Berlin* -**88**; dynamics, new, Lowe *Sc Am Sup* * Oct 12-**89**

Electro-dynamometers, for measuring alt. curs., Maneutrier, abs. *Inst C E* v 92 -**88** *Compt r* v 106 -**88**; for three-phase curs., Zickermann, abs. *Inst C E* v 108 -**92**, *Elek Zeit* -**91**

Electrograph (meteorological) Warner *El Rev* * Nov 22-**90**

Electrolysis, of iron salts, Watt *El Eng* Jan, Feb, Apr, June, July, Sep, tin salts, do. * Oct – * Dec -**88**; of cop. sulphate in standardizing elec. instrums., Meikle *El Rev Lond* * Mar 23, 30; of lead salts, Watt, Apr 6, 13, 27, of tin salts, do. * Sep 14, 28 * Oct 5-**88**; commercial, Andreoli, Oct 28, Nov 4, do. *El Rev* Dec 3; commercial, Swinburne, Aug 20, 27, do. *El Wld* Sep 3-24-**92**, Andreoli, Nov 26-**91**, Dec 10, 17-**92**; by the alt. cur., Mengarini * Aug 8-22; and actinism, Houston *F Inst* Dec -**91**; various substances *Sc Am Sup* * Sep 6-**90**; of water, hydrogen and oxygen production, industrial voltameter * Sep 12-**91**

Electrolytes, spec. inductive capac. expts., Rosa (full) *El Wld* * Oct 8-**92**

Electro-magnet, S. P. Thompson (very full) *El Rev Lond* * Sep 19 – * Dec 26-**90**, Jan 2-**91**, fallacies, do. *El Rev* Dec 13, 20 -**90**, types, Jan 24-**91**, do. (full) *El Wld* * Aug 30 * Sep 6, 27- * Dec 6-20-**90**, do. (very full) *Sc Am Sup* * Nov 22, 29 * Dec

Electro-magnet
6, 13, 20-**90** * Jan 10-31 * Feb 7, 14-**91**; a big, *Locom* Jan -**88**, *E & Min;* King's great *The Eng* Feb 10-**88**

Electro-magnetic, radiation, Fitzgerald *El Eng* * July 16-**90**; induction researches, Vignoles *El Rev Lond* * May 29-**91**; shunts, Moon, Jan 22; ampere-centimeter, a measure of electro-magnetism, Hering, July 29-**92**; radiation, Kimball *El Rev* * Dec 20, do. *El Wld* * Nov 8, 15-**90**; mechanisms, S. P. Thompson * Jan 17, 24 * Feb 21-**91**; machinery, notes, Aldrich (full) * Feb 13, 27 * Mar 19 * Apr 2, do. *F Inst* * Feb * Mar, do. *Pwr* * Mar -**92**; radiation, Fitzgerald *Sc Am Sup* * Aug 30; separator, Hall, cor. *The Eng* * July 18-**90**

Electro-metallurgy, Swan *El Rev Lond* Nov 25; Cazin *El Wld* * Apr 30, May 7, 14, 28, June 4, July 23, 30, Aug 6-20, Sep 3-24 * Oct 1-15-**92**; metallurgical processes, consumption of energy in, Pouthiere, abs. *Inst C E* v 98 -**89**, *Lum Elec* v 33 -**89**; Swan *Sc Am Sup* Oct 29-**92**; machine, Lauffen-Neuhausen *The Eng* Oct 5-**88**

Electrometer, guard-ring, for contin. readings, Jaumann, abs. *Inst C E* v 92 -**88**, *Central Elek* -**87**

Electro-motive properties of the human heart, Waller *El Rev Lond* * Oct 12-**88**

Electro-motors, governing, Ayrton, Perry *El Rev Lond* July 20-**88**; 'Agir' prize motor *E & Min* * Dec 7-**89** * *Industries.* See also DYNAMOS; ELEC. motors

Electro-physiology, D'Arsonval *El Wld* Oct 5, 12-**89**

Electro-plating dynamo, efficient, *El Rev Lond* * May 1-**91**

Electrostatic screening by gratings, etc., W. Thomson *El Rev Lond* Apr 17; ratio to electro-mag. induction, expts., Kennelly, June 12; induction, Taylor * July 31 * Aug 7-**91**; alternators, Muras * June 17-**92**

Electrotechnics, Ayrton, Pres. addr. *El Rev Lond* Jan 29-**92**

Elements and meta-elements, Crookes *Sc Am Sup* May 5-**88**

Elevated railroads. See RAILROADS Elevated

Elevators, Weehawken and viaduct, T. E. Brown, insets *Am C E* * v 27-**92**; brake straps lining material, Leavitt, discuss. *Am M E* -**88**; elec., and hoist *El Eng* * Oct 29-**90**; Sprague-Pratt elec. (full) * Nov 2, do. *El Wld* * Apr 2-**92**; elec., and (dock hoist) * Nov 1-**90**; Otis elec. * July 4-**91**
Eng Eureka safety hoist, n * Nov 16-**88**; Smith & Stevens', with safety gear * Mar 1; Eiffel tower hydr. lifts, Otis', Roux,

Elevators

Ansaloni, etc. * July 5-19; St. Lazare R. station, Paris, wagon hoists * 12-**89**; City & So. Lond. R. hydr. hoists * Dec 26-**90**; floating and spoil distributor, Baltic Sea canal, inset * Feb 20; Otis Pass., No. Hudson Cty. R., Hoboken, inset * May 22 * June 5, do. inset *E News* * Jan 17-**91**; pass., ed. Aug 10-**89**; Reno. continuous * Aug 25; Sprague-Pratt elec. * Nov 24-**92**

E Rec Eiffel tower lifts, Ansaloni, Aug 24 *Sep 7-**89**, do. elec. helicoidal, Audra, abs. *Inst C E* v 94 -**88**, * *Genie Civil* * v 13-**88**, do. insets *Inst M E* * July -**89**; evolution of, Sheridan *E Rec* Jan 24-**91**, *J Assoc E Socs*; Hall's hydro-steam, Hinchliffe, abs. *Inst C E* v 106 -**91**, *Tech Soc Pac Coast* -**91**; Weehawken, T. E. Brown, inset *R Gaz* * Jan 22; hydr., effic., Gale, Dec 30-**92**; Eiffel tower, Paris exhib., Nansouty *Sc Am Sup* * Apr 27-**89**; floating and spoil distrib., Baltic Sea canal * Mar 28-**91**

The Eng Stevens & Major's hydr. pass. lift, May 18; spiral elec., for Eiffel tower, Aug 3; Archer's hydr. balance, Columbus monument, Barcelona, Nov 23, 23-**88**; at Eiffel tower, Roux hydr. * Mar 22, Otis, Edoux and Roux, July 19-**89**; for Eddystone light-house model, Naval exhib., Lond. *Aug 21-**91**. See also CANAL lifts, Fontinettes; HYDR. lifts; RAILROADS, incline

Ellipses, the false, reduced by by equations of condition, Würtele *Am C E* * v 24-**91**; spacing, Grant *F Inst* * Apr -**89**; confocal, and applic. to mechanism, Gale * Feb -**91**; drawing by arcs of circles, Honey *Sc Am Sup* * July 5-**90**, and equiv. ovals of equal areas, do. * May 9-**91**. See also CURVATURE; DRAWING

Elswick arsenal and shipyard, inset *Eng* * Oct 18, 25 * Nov 1-29, Dec 6-**89**

Emery wheels, Paret *F Inst* * Mar -**90**; Am., 15 varieties, comparison, com. report, Nov -**91**; mounting *R & Eng* * Feb; French and Am. practice, cor. Mar -**89**

Emmons, Samuel F., por. *E & Min* * Apr 18-**91**

Employer's liability, ed. *Eng* Nov 16; do. accidents to workmen *The Eng* June 22, 29-**88**, *Genie Civil*

Energy, elec., from solar radiation, Osmond *El Eng* Mar -**89**; dissipation of, Kelvin *Littell's* May 14-**92**; conservation of *Locom* Oct -**89**; ed. *The Eng* Sep 28; Mulciber, cor. Oct 12, ed. 12, cor. 26, Nov 2, 9, Cherry, cor. Dec 7; Force and, theory of dynamics, Grant Allen, bk., Longmans, Lond. '88, Nov 30-**88**. See also ELEC. energy: FORCE

Engineer, the, his commission and achievements, Babcock *Am M E* v 9 -**88**; of the future, Barr *Eng* Oct 19, 26-**88**; who is an engineer, O. Smith *E Mag* Feb; financial status of, Gobeille *E Rec* May 14 *J Assoc. E Socs* Mar -**92**; use of theory in the work of an, Unwin *The Eng* Nov 16-30, Dec 7-**88.** See also ENGINEERS

Engineering (general), including Civil and Mechanical eng; prog., Becker, Pres. addr. *Am C E* v 20 -**89**; do. '89, Shinn, Pres. addr. v 22 -**90**; beginnings of, Watkins, and discuss., insets (full) * v 24; prog., Chanute, Pres. addr. (full) v 24 -**91**; (branches of) Grimshaw *Cassier's* Aug -**92**; eng. feats in the West, E. Ingersoll *Chaut* Oct -**88**; prog., Bellamy (ideas) *El Rev* Jan 11-**90**, *Harper's M* Dec -**89**

Eng electricity as applied to, Geipel, Feb 17, 24 * Mar 2, 9; theory, uses of, Unwin, Nov 16, 23-**88**; three aspects of, ed. July 22-**92**; what eng. owes to chemistry, Griswold *E Mag* Nov -**92**; how to begin in, ed. *E News* May 12-**88**; prog. in 1888, Cochrane, addr. June 1; do. Becker addr. 29-**89**; Cooley, Pres. addr. *E Rec* Feb 28; inspection, Nichols, Mar 21, 28-**91**; review of prog. *F Inst* Feb; is it on the decline, Le Van * July -**88**; prog., Sec'y report, Feb -**89**; prog., Bruce, Pres. addr. *Inst C E* v 91 -**88**; prog., relation to social progress., Berkley, Pres. addr. v 107 -**92**; prog., Pres. addr. *Inst M E* May -**92**; index of current literature *J Assoc E Socs* Nov -**88** and files; fifty years ago, stat. *Locom* July -**88**, *R & Eng*; prog., Chanute, Pres. addr., abs. *R Gaz* May 29, do. (full) *Sc Am Sup* Aug 8, 15-**91**; some eng. works, Corthell (full) Aug 2, 9-**90**

The Eng review of prog. Jan 6, 13-**88**; prog., ed. Jan 4-**89**; review of, ed. Jan; finance, costs, estimates, prices, Dec 19-**90**; review of '91, Jan 2; finance, ed. 16, do. shop orders, Apr 24, works accounts, stores management, Sep 4, 11; works, Ansaldo & Co., Sampierdarena * Mar 27-**91**; prog. review (full) Jan 1; prog., Unwin, Pres. addr., Brit. Assoc. Aug 5, 12-**92.** See also BRIDGES; BUILDING; ELECTRIC — HARBOR — HYDRAULIC — MARINE eng; MATERIALS; METALS; MILITARY — MINING — MUNICIPAL — NAVAL eng; RAILROADS; ROADS; SEWERAGE; TELEGRAPH; TUNNELS; WATER-works, etc.

ALPINE. See ALPINE engineering

AMERICAN Academy of, proposed, Pope *R Gaz* Nov 29-**89.** See also ENGINEERS, Am. Acad.

ASSOCIATIONS. See ENGINEERS' Societies

Engineering, CIVIL, advancement of the profession of the civil engineer, Herschel addr. *E News* Apr 11, 18, May 2-**91**; the water-jet as aid to construction *E Rec* Aug 3-**89**; embankments, direction of earth thrust against a wall, F. P. Spaulding *Lehigh Eng J* Apr -**88**; in Brit. colonies, Coode *Sc Am Sup* Jan 11-**90**, *Inst C E*; topography, geology and geodesy, summer course in, Burton and Swain *Soc Arts Mass* -**89**. See also ARCHES; BEAMS; BRIDGES; BUILDING; CANALS; CEMENTS; CONCRETE; CULVERTS; DAMS; EARTHWORK; ENGINEERS; EXCAVATING; FOUNDATIONS; HARBOR-HYDRAULIC eng; INSTRUMENTS; LAND; LAW; MAPS; MATERIALS; MILITARY—MINING—MUNICIPAL eng; PAVEMENTS; RAILROADS; RESERVOIRS; RETAINING walls; ROADS; SEWERAGE; STREETS; SURVEYING; TUNNELS; WATER-works, etc.

CITY. See MUNICIPAL engineering

CONGRESS, Internat., ed. *Eng* June 12-**91**, 1893 *E Rec* Nov 1, Chic. convention report *R Gas* Nov 14-**90**

CONSTRUCTION, I. O. Baker, bk. review *E News* Oct 19-**89**. See also BUILDING; FOUNDATIONS; MASONRY; RAILROADS, construction, etc.

EDUCATION of apprentices, Garnett *The Eng* Oct 25-**89**. See also EDUCATION; ENG. schools

GOVERNMENT, Nat. Pub. works *F Inst* Aug -**88**

LABORATORY, need of an, Potter, Pres. addr. *Am Min* v 17 -**89**; notes, Beare *Eng* Mar 4, 11-**92**; the Walker labs., Liverpool *The Eng** Nov 8-**89**. See also ENG. schools; SCHOOLS

LITERATURE index. See INDEXES

MECHANICAL, the steam engineer, Laurie *Cassier's** Sep -**92**; steam in mod. civilization, Loring, Pres. addr. *Am M E* v 13 -**92**, *E News* Dec 8-**92**; dynamics, a question of, Gilman, cor. July 14-**88**; heating water, notes *Locom* Mar; the chalk age of, Holloway *Sc Am Sup* June 16-**88**; in elec. industries, Perry (full) Dec 7-**89**. See also AIR engines; BELTING; BOILERS; BOLTS; CHIMNEYS; COAL; CRANES; DYNAMICS; DYNAMOMETERS; ELECTRIC eng; ENERGY; ENGINEERS; ENGINES; FORCE; FRICTION; FUEL; FURNACES; GAS; GASES; HEAT; HEATING; HORSE power; LOCOMOTIVES; MACHINERY; MACHINES; MACHINE shops; MARINE boilers, engines; MECHANICS; MILLS; POWER transmission; PUMPING engines; RAILROADS; STEAM; STEAM hammers; heating, plants; TELPHERAGE; TURBINES; WIRE ropes, etc.

Engineering, MINING. See MINING engineering
MUNICIPAL. See MUNIC. eng. and also under names of cities
NEWS, growth of, ed. *E News* Oct 6-**88**
NOTES, best form of scrap cabinet for, T. Miller *E News* * Feb 1; from the far west, Fowler, cor. Oct 18-**90**
SCHOOLS, graduating theses, premiums for *E News* Jan 30, of U. S. Mar 19 — May 5, 19, 26, June 9, 30 — * Sep 22, Oct 6 — Nov 24, Dec 1-22-**92,** etc. See also SCHOOLS
SOCIETIES, Am., comparative growth, ed. *E News* Sep 22-**88;** financial management of, table, Dec 13-**90.** See also ENGINEERS; SOCIETIES

Engineers, demand and supply of (Eng. Schools), table *E News* Aug 4; consulting practice, ethics of, ed. Nov 10-**92;** contractors and the public *E Rec* Oct 3, Nov 7, McMath, Dec 5-**91;** Brit. colonies as fields for civil, Coode. Pres. addr. *Inst C E* v 99 -**90;** Am., professional status, Crowell, cor. *R Gas* Dec 16; World's Congress of *Sc Am Sup* Feb 20-**92;** function of in contracts, legal decis. *The Eng* Dec 4-**91.** See also ENGINEER
AMERICAN, in Europe *Eng* July 5, 12, 26-**89**; guests of *E & Min* Sep 20, Oct 11-25, Nov 1-**90**
AM. Academy of, proposal for *E & Min* Dec 14, proposed, Pope *R Gas* Nov 29-**89**
AM. Institute Electrical, pro., pors. *El Wld* * May 30-**91.** See also ELEC. engineers
AM. Soc. Civil pro. *Eng* Apr 20, May 4-**88,** Feb 14, Aug 29 * Sep 5, 12-**90,** Aug 14 * 21, 28-**91**; *E News* Jan 21, July 7, 14, Oct 20-**88,** Jan 19, June 29, July 6-**89,** membership, etc. Jan 18, founders of, cor. Mar 8, July 5, 12-**90,** geographical distrib. of voting members, map * Jan 10, an. meeting, 24, Lookout Mt. May 30-**91,** Jan 23, June 2, 16, Cohen addr. July 7-**92;** *E Rec* June 29-**89,** July 5-**90,** Jan, May 30-**91,** June 11, 18-**92**
R Gas July 6-**88,** June 28, an Am. Soc. proposed, J. B. Johnson, Aug 23, reorganization, ed. Oct 25-**89,** Jan 10, 17, July 4-**90,** May 29-**91,** June 17-**92;** *The Eng* June 1-**88,** July 8-**92**
AM. Soc. Mechanical pro. Phila., Nov '87, Nashville, May '88, v 9-**88,** Scranton; See, Pres. addr. Oct '88, Eric, deceased members and rules, May '89, v 10 -**89,** N.Y. Towne, Pres. addr. Nov '89, Cincin., memorial notices, May '90, v 11 -**90,** Richmond, European trip of, Nov '90, Prov., O. Smith, Pres.

Engineers, AM. Soc. Mechanical
addr. June '91, v 12 -**91,** N. Y., R. W. Hunt, Pres. addr. Nov. '91, San Fran. May '92, v 13 -**92**; *Cassier's* * Dec -**91**
Eng * Jan 6, 13, 27 * Feb 3 * July 6-20-**88,** Jan 11 * 18 * July 5, 19, 26, Aug 2-**89** * Jan 10-31 * Feb 7 * July 4-25 * Aug 1-**90** * Jan 9-23, July 3 * Sep 11-25, Oct 2, Dec 11, 18-**91**; *E & Min* Richmond meeting, Nov 15-**90**; June 27-**91**
E News May 19, 26, Oct 27, Nov 3-**88,** May 24-24-**90,** Prov. June 20, 27, ed. Nov 21-**91,** Dec 8-**92**; *E Rec* June 20, 27-**91,** Dec 10, *Iron Age* * Dec 8-**92**; *Pwr* July -**91**; *R Gaz* May 11, 25, Oct 19-**88,** Erie, May 24; * Nov 22, 29-**89,** Cincin. May 23; Nov 14, 21-**90**; Prov. June 26; Nov 20, 27-**91** * Dec 2, 9-**92**
AM. Inst. Mining. See MINING engineers
CANADIAN Soc. Civil pors., Houghton *Cassier's* * Nov, inset * Dec -**92** * Jan -**93,** pors. *El Rev* * Aug 29, pors. *El Wld* * Sep 12-**91**
CITY, duties of, ordinance, Salt L. City, Utah *E News* Aug 30 -**90**
CIVIL. See ENGINEERS, Am. Soc. Civil — Canadian
CLUB of, Phila. pro. *E News* June 30-**88**
ELECTRICAL. See ELEC. engineers
ENGLISH societies, notes, cor. *E News* Mar 15-**90**
FRENCH gov't. *E News* Oct 25-**90**
GERMAN Soc. pro. *Eng* Sep 5-**90**
INST. Civil, London, pro. *Eng* Nov 15-**89,** Oct 17, bk. n Nov 21-**90,** May 29, Nov 13-**91,** review, Dec 30-**92**; *E News* June 30-**88,** benevolent fund of, July 26, history, ed. Dec 6-**90**; *Inst C E* building v 94 -**88,** an. report, v 98 -**89,** v 102 -**90,** v 106 -**91**; v 110 -**92**; *The Eng* open hearth steel for boiler making, Jan 20; Mar 2, 16, Apr 6, May 11, bk. n Nov 16, 30, Dec 7-**88,** Pres. addr. Nov 15-**89,** Mar 14, 21-**90,** Nov 13, 20 -**91**
INST. Mechanical pro. *Eng* Feb 10, 17, May 11, Carbutt, Pres. addr. Aug 3, 3, 10, 10 * 31; Nov 2-**88,** Feb 1-15, Pres. addr. May 10, 10, 24, July 5, 12, Nov 8-**89,** Jan 31, Feb 7, Tomlinson, Pres. addr. May 9, 9, Aug 1, 8, Oct 31, Nov 7-**90,** Feb 6, Mar 27, May 8, June 31, Aug 7, Oct 30, Nov 6-**91,** Feb 12, Anderson, Pres. addr. May 13, 13, 20, July 29, Aug 5, Oct 28, Nov 4 -**92**
E News Aug 16, 23-**90,** an. meeting, Feb 21, Aug 22-**91,**

Engineers, INST. Mechanical
an. Feb 27-**92**; *Inst M E* list, by-laws, etc., Cochrane, Pres. addr. May -**89**, Tomlinson, Pres. addr. May -**90**, list members, Oct -**91**, Anderson, societies' prog. May -**92**; *The Eng* Aug 3, in Ireland, 10, 24-**88**, Paris exhib. July 5, 12-**89**, Tomlinson, Pres. addr. May 9-**90**; July 31-**91**, Anderson addr. May 6; July 29, Aug 5, Oct 28, Nov 4-**92**
MECHANICAL, advice to young, Perry *Sc Am Sup* * Sep 1-**88**. See also ENGINEERS, Am. Soc. Mechan — Inst. Mechan.
MUNICIPAL. See MUNICIPAL engineers
WATER-works, the practice of, ed. *E News* Mar 22-**90**

Engine room, experience, Lyne *Am M E* * v 10 -**89**; appliances *Pwr* * Jan - July * Sep - Dec -**90** * Jan - Apr * June - Dec -**91** * Jan - Dec -**92**; telegraph, Thackeray & Hurn's *The Eng* * Jan 17-**90**

Engines, *Am C E* wastes, Thurston * v 23 -**90**; *Am M E* steam consumption at various speeds, Denton-Jacobus * v 10; non-condens., cost of power, Emery * 10-**89**; Hirn & Dwelshauver's theory of, Thurston, v 11; transmiss. of force in, general solution, Jacobus * v 11 -**90**; limitations of economy, Nagle v 13; econ. and effic. of, Peabody, v 13 -**92**; aut., economics of, Thurston *Cassier's* * Nov -**92**; principles and development, Dickerson addr. (full) *El Rev* * Jan 26, Feb 16-**89**

Eng heat in the, Dwelshauvers-Dery, Donkin * July 27; for elec. light, Glasgow exhib. * Aug 3-**88**; theory of the, ed. Mar 29, Apr 12 * May 31, June 21, 28; stationary, Paris exhib. Aug 16-**89**, hor. do., inset * Jan 3; Fairfield works, Govan * Sep 26 * Oct 3, 24 * Nov 21 * Dec 12; small, econ. of, ed. Nov 14-**90**; stationary practice in Am., Stanwood * Jan 2, 16, 30 * Feb 20 * Mar 13 * Apr 17 * May 1, 8, 29 * June 12, 26 * July 10-**91**; Thurston, bk. review, Sep 2; heat distrib. in * Nov 25-**92**

E Mag the prime mover, Iredell * July -**91**; steam and development of power by the steam engine, Isherwood *F Inst* Oct, Nov -**90**; economics of aut., Thurston, insets * Oct -**92**; vel. variations, cyclical, Ransom, inset *Inst C E* * v 98 -**89**; 2000 h.p., Warren, R. I. *Pwr* * June -**89**; new developments in eng., Rockwood, June -**92**; econ. of non-condensing, Willans, trials *R Gas* Apr 6-**88**; thermodynamics of, Peabody, bk. review, table, June 26-**89**

Sc Am Sup mod. improvements, S. A. Smith, Mar 17-**88**; the principles and devel., Dickerson * Feb 23-**89**; manage-

Engines

ment * Apr 26; 100 h.p., for elec. lighting, Berlin * May 17-**90**; the builders of, Thurston, May 16, 23-**91**; theory of *The Eng* July 6, 20; Nottingham Show, July 13-**88**; Cotterill, bk. review, Dec 26-**90**. See also AMMONIA — ETHER — HOT air — MARINE—MILL — PETROLEUM — PUMPING — ROAD — ROLLING mill—ROTARY—TRACTION—WINDING—engines; LOCOM.

AIR pumps and condensers, Towler *The Eng* * Apr 29 * May 13 -**92**

AM. high speed *El Rev* * Mar 5, *E & Min* * Mar 5, *Pwr* * Mar -**92**. See also ENGINES, high speed

BEAM, Whitbread brewery, Boulton & Watt, 1785 *Eng* * July 27 -**88**

BELGIAN, inset *The Eng* * Jan 16, 16-**91**

BRAKE, the Appold, expts. *The Eng* Jan 13, 20-**88**, Dec 2-**87**, Schonheyder, cor. *Eng* July 28-**76**

BREAKDOWNS, Sweet *Cassier's* Nov -**91**

BURGIN high speed *R & Eng* * Jan -**90**

COLLIERY, econom. use of steam in, McLaren, trials *The Eng* July 17-**91**

COMPOUND *Am M E* performance of a, Barrus, * v 9 -**88**; use of for manuf., Main * v 10; cyl. ratios of triple-expansion, Whitham * v 10 -**89**; philosophy of the multi-cyl. engine and its limitations, Thurston, v 11 -**90**; single-acting, Bole * v 12; test of a trip-expan., Henthorn * v 12; applic. of Hirn's anal. to multiple-expan., Peabody, v 12 -**91**; two-cyl. vs. multi-cyl. engines, Green-Rockwood * v 13; steam distrib. in single-acting, Rites * v 13 -**92**

Cassier's philos. of multi-cyl., Thurston, Nov; trip-expan., effect of compression on shaft friction, Alden * Nov -**91**; trip-expan. experimental, Peabody * Mar; tandem, New Haven Elec. L. Co. * Apr; steam distrib. in single-acting, Rites * May; with Proell valve gear * Aug -**92**; Strong trip-expan. (vertical) *El Eng* * Sep 28, do. *El Rev* * Oct 15-**92**; Jonson's stationary (vertical) *El Wld* * Sep 7-**89**; the Triumph * Feb 15-**90**

Eng Guinness grain stores, inset * Feb 3; and non-compound, steam consumption of, trial, Willans, Mar 16; hor., Glasgow exhib. * Nov 9; hor., Whitbread brewery, inset * 30-**88**; vertical, valve gear * May 31; hor., Sulzer, Paris exhib. July 26, inset * Oct 11; tandem, Frikart system, do., inset * Aug 23, hor., inset * Sep 6, 6, inset * Nov 22-**89**; Corlis hor. do. *

Engines, COMPOUND

Feb 14, trip-expan. hor. do. * Apr 4, 11; Lyon's slide valve * May 16; hor., Frikart valve gear, inset * June 20-**90**; Kaiser-I-Huid cotton mills, Bombay, inset * May 8; trip-expan. experimental, Allis * Aug 14-**91**; 1600 I. h.p. tandem, inset * Nov 25 -**92**

E News non-condens., steam consumption of simple and, Williams, May 5; Westinghouse aut. * 5-**88**; Jonson's balanced * May 4-**89**; Strong's 250 h.p. trip-expan. vertical * Sep 22; steam distrib. in single-acting, Rites * Oct 20-**92**

F Inst philos. of, Thurston, Dec -**89**, of multi-cyl., do. Jan * Feb -**90**; the Triumph *Pwr* * Mar -**90**; trip-expan. vertical * Mar -**91**; Strong's do. * Oct -**92**; the Woolf *R & Eng* * Apr -**88**; Willan's trip-expan. * Aug -**89**, do. central valve *Sc Am Sup* Jan 19-**89**; quad-expan. mill * Dec -**92**; Westinghouse *R Gaz* * May 4-**88**; steam distrib. in, Rites * May 27-**92**; trip-expan. experimental, Peabody, Hirn's anal. *Tech Q* * Oct -**91**

The Eng 200 h.p. hor., Crompton, Jan 20; portable self-propelling, Cooper, Apr 27; hor., Glasgow exhib. May 4, 4; trunk air-pump, str. Hector, June 8; a new tandem, Turner, July 20, 20; triple semi-port., Nottingham Show, 27; 800 h.p. tandem, with Proell gear, Sep 7, 7; Willan's trip-expan. central valve, Dec 14-**88**; 400 h.p. condensing. Brussels exhib. * Feb 22; 350 h.p. Carel's, July 5; trip-expan., with Corliss gear, 26; tandem, Berlin elec. station, Sep 6; the Globe * Nov 29; 400 h.p. Sulzer * Dec 6-**89**

The Eng trip-expan French, Paris exhib. * Jan 10, 10; Fives-Lille condens., do. * Mar 14, 14; str. Hercules, 1830, inset * Mar 21 * Apr 11, gear * May 2; and trip-expan., ed. 9; Watt's, 1820 * June 27; 250 h.p. vertical * Aug 22, 22; 2000 h.p. condens. * Oct 3-**90**; trip-expan. vertical condens. for elec. lighting, inset * Feb 6, 6; Corliss mill * Mar 13, 27; 1000 h.p. trip-expan. mill * Aug 7-**91**; 1000 I. h.p. do. Indian Midland R. * Aug 26-**92**. See also AIR compressing — BLOWING — MARINE — PUMPING engines, etc.

COMPOUNDING centrif. and load governing by rotary piston valve, Aldrich *Am M E* -**92**

CONDENSERS, Kinealy *Sc Am Sup* Mar 16-**89**, *J Assoc E Socs*. See also CONDENSERS

CONNECTING rods, Mattes *Am M E* * v 9 -**88**. See also LOCOMOTIVES, conn. rods

Engines, CORLISS econ. of compound and single cyl., Jacobus *Am M E* * v 12 -**91**; cut-off and compression in, Stanwood *Cassier's* * Jan; valves adjusting, Pray * Feb -**92**; 2500 h.p. mill *Eng* * Mar 23, inset * Apr 6, 6; hor., inset * Apr 20-**88** * Jan -**89**; hor., Paris exhib. * Feb 14-**90**; cut-off and compression, extending range of, Stanwood * Dec 18-**91**; with non-detaching gear * Aug 26-**92**

CRANK pins, method of securing, Collins *Am M E* -**88**; crank device, Micheles *Eng* * July 10-**91**; crank angle for max. vel. of piston * July 15-**92**

CYLINDER condensation, of steam in, surface condensers, Whitham *Am M E* -**88**; effect of steam jacket on, Bird * v 12-**91**; thermo-elec. method of studying, Hall *El Eng* * June 24, do. *El Rev Lond* * July 3, do. *El Rev* * June 27, do. *El Wld* * June 20-**91**; Conover condenser *El Rev* * July 30-**92**; condensers, theory, Dwels.-Dery *Eng* Sep 13; action of steam in, expts., English * Nov 8, 15-**89**

Inst C E glass ap. for rendering visible effects of, Donkin, abs. v 97 -**89**; *Bul Soc Mul* -**89**; heat expenditure, the cyl. heated externally by gas-flames, Donkin, expts., inset, do. Dwels.-Dery, Unwin trans. (full) *Inst C E* * v 98 -**89**; cyl. walls temp. taking at different depths in the metal, Donkin * v 100 -**90**; thermal action of cyl. walls, Dwels.-Dery, abs. v 103 -**91**, *Bul Soc Mul* Aug, Sep -**90**; movement of heat in, Kusch, abs. *Inst C E* v 107 -**92**, *Zeit deut Ing* -**91**; and re-evap., expts., English, insets (full) *Inst M E* * Oct -**89**, initial condens., during admission, do. May -**92**; thermo-elec. method of studying, Hall, *R & Eng* * Feb -**92**, *Am Inst Elec Engrs*

The Eng ed. Dec 21-**88**; theories of, ed. Mar 8; Donkin's co-efficient, ed. 29; and re-evap. in jacketted cyl., expts., English * Nov 8-**89**; cyl. walls temp. cal., Donkin, diags. * Sep 25 * Oct 9; thermo-elec. method of studying, Fitz-Gerald * Oct 16 -**91**; expts., Donkin, ed. July 15; Dwels.-Dery, cor. Aug 26, Sep 2-**92**

CYLINDERS, proportioning, Thurston *Am M E* v 9 -**88**; two cyls. vs. multi-cyl. engines, Green & Rockwood -**92**; deposits anal., Stillman *Cassier's* Nov -**92**; action of steam in, expts., English *Eng* * Nov 8, 15-**89**; expts. on temp. of metal, Donkin, inset *Inst C E* * v 106 -**91**. See also ENGINES, cyl. condensation

DIRECT connected, Werner *Cassier's* * June - Sep -**92**

Engines, DODD'S high-speed *Eng* * Oct 5-**88**
ECLIPSE Corliss, Frick Co. *The Eng* Mar 30-**88**
EFFICIENCY, the ideal compared with the real, Thurston *E News* * July 4, do. *Am M E* * v 12 -**91**; and econ. of, Peabody * v 13 -**92**; Dwels.-Dery *Eng* Feb 21; standard, Bodmer, Mar 7, do. Elliott, cor. 21-**90**; *Locom* Dec -**88**; Dery, cor. *The Eng* Oct 25, cor. Nov 1-**89**; standard of * Feb 7, 21, Mar 14, Apr 25-**90**
ERIE City aut. cut-off *Pwr* * May, *R & Eng* * May -**88**
EXPERIMENTS. See ENGINES, tests and trials
FISHKILL Corliss, with Cite's releasing valve gear *Pwr* Aug -**88** * Aug -**90**
FLY-wheel, novel, Manning *Am M E* * v 13 -**92**; and govs., Dwels.-Dery, Donkin *Inst C E* * v 104 -**91**, do., Ransom, insets * v 109-**92**; breakage at Amoskeag mills, Manchester, N. H. *Pwr* * Nov * Dec -**91**
FOUNDATIONS *Pwr* * Apr * May -**91**
FRICTION, internal, of non-condensing, Thurston *Am M E* * v 9 -**88**, abs. *Inst C E* v 92 -**88** *E News* May 26-**88**; speed and work, variable load and internal friction, do. *Am M E* * 10-**89**, expts. *R Gaz* * Dec 28, (full) *Sc Am Sup* * Oct 27 * Nov 3-**88**; distrib. of internal, do. *Am M E* v 10 -**89** *Eng* * Jan 4-18-**89** *F Inst* * Nov, (full) *Sc Am Sup* Nov 10, 17-**88**; of slide valves, ap. for testing, Aspinall *The Eng* * Mar 22-**89**
GOVERNORS, J. M. Smith, a use for inertia in shaft govs., Armstrong *Am M E* * v 11 -**90**, do. *E News* * July 19-**90**; governing of engines, Aldrich *Cassier's* Sep -**92**; Wilby supplementary *Eng* * Apr 20-**88**; action, new method of investigation, Dwelshauvers-Dery, Longridge, trans. *Inst C E* * v 94 -**88** * v 110 -**92**; speed regulators, Marie abs. v 93 -**88** *An Mines* * 12 -**87**; the Westinghouse *R & Eng* * July -**91**; Tyrrel's *The Eng* Dec 28-**88**; Nadberg's aut. cut-off * Sep 18-**91**
GRABNER'S, combined piston and valve *E News* * Oct 26-**89**
HIGH-speed, comparative fuel econ. of, Barrus, etc., discuss. *Am M E* v 9-**88**; high and low speed, Church, Powers *El Rev Lond* Aug 17, *El Eng* Apr 13-**88**; P. Atkinson *Lehigh Eng J* Feb -**89**; Rigg's revolving *The Eng* Jan 27-**88**
HISTORY, early *Cassier's* * Nov -**91**; 50 years ago, number, etc., ed. *R & Eng* July -**88**
INDICATOR diagram, Emery *Am M E* * v 9-**88**; motion device, Jacobi * v 10 -**89**; rigging for compound engines, Par-

Engines, INDICATOR
sons, length of card, Webb, the comparison of indicators, do. * v 11 -**90**; the Tabor *Eng* * June 7-**89**; errors of *E News* * Feb 9-**89**; the Perry * Sep 5-**91**
Pwr indicating * Aug - Oct -**88** * June - Aug * Nov -**89**, comparison, Webb * Jan, Feb -**90**; files to * Dec -**92**; Bagshaw's diagram meter *The Eng* Aug 24-**88**; the Tabor, July 19; combined diags., Gill, cor. Aug 23, Campbell, 30 * Oct 11-**89**. See also INDICATORS, continuous, etc.
KIMBLE, the *The Eng* * Oct 2-**91** *Pwr*
LIDBACK'S vibrating *F Inst* Oct -**88**
LYON'S compound slide valve *Eng* * May 16-**90**
MCEWEN aut. *El Wld* * Apr 16-**92**
MOTOR, an alleged new, Lautreppe *E News* Jan 7-**88**
NOBLE'S vertical *The Eng* * June 20-**90**
PHILADELPHIA Corliss *Pwr* * Jan -**92**
PISTON packing, new principle in, Sweet *Am M E* * v 9 -**88**; friction of packing rings, Denton * v 10 -**89**; rod packings *Pwr* * Jan -**88**; rod breakages, report *R & Eng* * Nov -**90**
PORTABLE, with removable fire-box and tubes *Eng* * May 10-**89**; semi-portable trip-expan. *E News* * Aug 11-**88**; how erected *The Eng* * Sep 11-**91**
PYLE aut. and dynamo (multiple cyl.) *El Wld* * Aug 29-**91**
RIGG'S high-speed revolving *The Eng* Jan 27-**88**
ROBB-Armstrong, n *E & Min* * Sep 10-**92**
SHIPMAN aut. *The Eng* July 27-**88**
SLIDE valve diagrams, Thallmayer, cor. *Eng* * Mar 15-**89**; balanced slide valves, Park, inset *Inst C E* * v 98-**89**; Ætna balanced *Pwr* * Oct -**90**; friction of, ap. for testing, Aspinall *The Eng* * Mar 22-**89**. See also ENGINES, valve gears
SPEED register, Duveau's *Eng* * Sep 27, *Sc Am Sup* * Nov 9-**89**; regulators, Marie abs. *Inst C E* v 93 -**88** *An Mines* v 12 -**87**; speed and work, Thurston *Am M E* * v 10 -**89**, expts. *R Gaz* * Dec 28, (full) *Sc Am Sup* * Oct 27 * Nov 3-**88**; Corliss valves setting *Pwr* * Mar -**90** * Nov -**92**; valves * June -**90**; Child's piston *R & Eng* * Jan -**89**; valves, Hawley *Sc Am Sup* * Jan 31 * Feb 14-**91**. See also ENGINES, governors — high-speed
STEAM jacket, authorities on, Thurston *Am M E* v 12 -**91**, do. Donkin *Inst C E* v 104 -**91**; influence of, Kent *Cassier's* * Dec -**91**; Dwels-Dery *Eng* Dec 13-**89**; econ., notes from an

Engines, STEAM jacket
eng. lab. Dec 25-**91**; value, com. report, Oct 28, Davey, 28, Nov 4, expts. * Dec 9-23-**92**, do. (full) *Inst M E* Oct -**89**; max. effic., Thurston *F Inst* * Apr -**91**; effic., ed. *The Eng* Nov 28-**90**; value, com. report, Oct 28-**92**.
STRAIGHT Line, 100 h. p. *El Wld* * Aug 24-**89**
STRONG'S trip-expan. vertical *El Eng* * Sep 28, *El Rev* * Oct 15, 250 h. p. *E News* * Sep 22, *Pwr* * Oct -**92**
SULZER, Brussels exhib. *The Eng* Aug 17-**88**
TESTS and trials *Am M E* of several types, Carpenter * v 11-**90**; compound trip-expan., Henthorn * v 12; applics. of Hirn's anal. to, Carpenter * v 12 -**91**; testing, Ihlseng *Cassier's* * Apr; compound multi-cyl., Green * May -**92**
Eng Royal Agric. Soc. at Newcastle, Shaw, cor. * Jan 6; steam consump. of compound and non-comp., Willans, Mar 16; Highland Soc. Show, Nov 16-**88**; Soc. of Arts, ed. Mar 29; Dulwich College experimental * Nov 1; at Whitworth eng. lab. trials, Manchester, Reynolds, Dec 13-**89**; Sulzer type hor. trip-expan. 200 h. p., Schröter * Dec 5-**90**; compound, expts., Reynolds *E & Min* * Aug 9-**90**
E News several types, Carpenter, table, Aug 2-**90**; econ. of non-condensing, simple, compound and triple, Willans, and discuss., insets (very full) *Inst C E* * v 93 -**88**, reply to cor. * v 96, Westinghouse test, Alley, n v 96 -**89**; at Whitworth eng. lab., Manchester, Reynolds, and discuss., inset (full) * v 99 -**90**
Pwr compound, Howland mill, New Bedford, Mass. (full) * Dec -**89**; Utica, N. Y. Steam Cotton mills power plant, Carpenter * Aug -**92**; econ. of non-condens., Willans *R Gaz* Aug 6 -**88**; expts. at Mass. Inst. Tech., Purinton, general review of tests, Peabody (full) *Soc Arts Mass* -**88**; Purinton *Tech Q* * Feb -**88**
The Eng econ. of non-condens., Willans Apr 6; Highland Agric. Soc. Aug 3-**88**; Soc. of Arts * Feb 22 * Mar 1, 8-**89**; Royal Agric. Soc. July 4-**90**; colliery, econom. use of steam in, McLaren, July 17-**91**
THREE-cylinder, Paris exhib. *Eng* July 12-**89**
UNDERGROUND hauling, Ilkeston colliery *Eng* * Nov 23-**88**
VALVE gears, effect of unbalanced eccen. or gov. ball on valve motion, Sweet *Am M E* * v 11 -**90**; Proell gear on compound *Cassier's* * Aug -**92**
Eng Payton's * Aug 17-**88**; compound vertical * May 31;

Engines, VALVE gears
hor. engine with Wheelock gear, Paris exhib., inset * Aug 9; Bremmes' * Oct 11; radial gears, J. R. Smith * Nov 22, 29-**89**; radial gears, Payton, cor. * Jan 24; Bremme's, cor. * 24; Frikart gear, comp. hor., inset * June 20-**90**; Walker's Corliss, n * July 24-**91**; the Zenner valve motion diag. Gow *F Inst* Sep -**88**; prob., graphic solution, Weihe *Lehigh Eng J* Apr -**89**
Pwr Fishkill Corliss with Cite's releasing gear * Aug -**88** * Aug -**90**; link motion, Lyne * Apr, June -**89**; Corliss valves setting * Mar -**90** * Nov -**92**; valves * June -**90**; Child's piston valve *R & Eng* * Jan -**89**; radial gears, J. R. Smith * Feb * Mar, Morton radial * May -**90**; valves, Hawley *Sc Am Sup* * Jan 31 * Feb 14-**91**; Proell gear, 800 h. p. tandem comp. *The Eng* Sep 7, 7-**88**; the Cross gear * Apr 4-**90**. See also ENGINES, slide valves.
WESTINGHOUSE aut. compound *E News* * May 5, *R Gas* * May 4-**88**

England, taxation, local expenditure, ed. *Eng* July 26-**89**; trade relations with Am., McCormick, and ed. Apr 8, 29-**92**; coaling stations, defences of, Hong Kong *The Eng* * Jan 18, Singapore * Feb 1, Aden * Mar 15, Cape of Good Hope * Apr 5-**89**. See also BRITISH; GREAT Britain

English notes *E & Min* Aug 24, 31, Sep 14, 21, Oct 12, Nov. 23-**89**. See also GREAT Britain

English, Thomas A. *Inst C E* v 97 -**89**

Engraving rail sections, 4 styles, etc., ed. *E News* * Dec 27-**90**

Entomology, Riley (full) *Sc Am Sup* Jan 17-31-**91**

Ericsson, John *Eng* Mar 15-**89**, Church, bk. review, Feb 13-**91**, por., inventions, etc., and ed. *E News* * Mar 16-**89**, *Locom* Apr -**89**, por. (full) *R & Eng* * Apr -**89**, life of, Church, bk. review, Jan -**91**, por *Sci Am* Mar 16, Capt., and his work, 23-**89**, MacCord (full) *Sc Am Sup* Feb 8-**90**, *Stevens Indic*, ed. *The Eng* Mar 29-**89**

Esparto. See PAPER, Esparto (fibre)

Estridge, Joseph *Inst C E* v 106 -**91**

Ether, elec. and ponderable matter, W. Thompson (full) *El Wld* * Apr 27-**89**; first capital operation, Slade *Scribner's* Oct -**92**

Ether engine, Susini's *Sc Am Sup* * Nov 14-**91**

Ethics and railroad supplies *R & Eng* Dec -**89**

Etna, volcanic eruption *Sc Am Sup* Aug 27-**92**

Evaporation of moisture from various substances, expts., Worrell, table *Sc Am Sup* July 7-**88**

Events, current, monthly record *Harper's* files

Evolution *Locom* Aug -**89**; mental, in man and lower animals, Bodington *Sc Am Sup* Aug 6-**92**

Ewing, J. A., por. *El Wld* * Jan 17-**91**

Excavating and excavators, Panama Canal, Willans, insets *Am C E* * v 19 -**88**; steam, Clements *Am M E* * v 9 -**88**; methods and cost of working by steam excavs., Clements *E News* * May 26, June 9-**88**; a great rock excav., Tilly Foster mine, Brewster's station, N. Y. * Apr 20; excavator for sewer trenches * Sep 27-**89**; and hoisting machinery, the White, Minn. * June 6-**91**; trenching and pipe laying, Fitz Gerald *E Rec* * June 15; timbering shafts, Croton aqueduct * Aug 17, 31-**89**; at Panama canal, Nansouty, abs. *Inst C E* v 94 -**88** * *Genie Civil* * v 13 -**88**; Darby broadside steam digger *Sc Am Sup* * Sep 1-**88**, *Iron*. See also DREDGING; MINING; SEWERAGE; TUNNELING

Executions, methods, n *Locom* Jan -**90**. See also ELEC. execution

Exhibitions, ethics of great, ed. *Eng* July 4-**90**. See also ELEC. exhibs.

AGRIC. Soc., Royal, Show, Doncaster *Eng* * June 26; *The Eng* * June 19, 26-**91**

AM. Institute fair, N. Y. *Sci Am* Oct 20-**88**

CRYSTAL Palace Elec. *The Eng* * July 22-**92**

EDINBURGH, 1890 *Eng* inset * Apr 11-25, May 30, June 20 * July 11, 25 * Aug 15, 29 * Sep 19, 26 * Oct 10; *The Eng* Mar 28, buildings * May 2-**90**

FRANKFORT Elec., plan *Eng* * July 18-**90** * May 8, 22, 29 * June 5-July 24 * Aug 7-28, Sep 4 * Nov 13, *The Eng* * Sep 18, 25 * Oct 2-**91**

GLASGOW Internat. *Eng* Mar 23, plan * Apr 20, May 4, 25, June 8-29, July 13 * Aug 3, 10, Nov 9-**88**, *The Eng* Nov 18-**87**, Apr 27, May 11, June 1-**88**

MOSCOW, French Elec. at *Eng* * Aug 21, 28 * Sep 4, Oct 2-**91**

NAVAL, Royal, London *Eng* * Feb 13, May 1 * June 5, 12 * July 17-31 * Oct 2-16 * Nov 27 * Dec 11-25, *The Eng* * Mar 13 * May 1-29 * June 5-26 * July 10-31 * Aug 14, 21-**91**

PARIS, notes *El Wld* Oct 5, 12-**89**, ed. *Eng* * Apr 27, May 11, inset * June 1, 29, ed. July 27 * Aug 10, 31, ed. Sep 28 * Nov 2-

Exhibitions, PARIS

30 * Dec 14-**88** * Jan 4, 25 * Feb 1, inset (full) * May 3, ed. 10, 17, 24, * June 7, 7, means of transport * July 5-26 * Aug 2, 16, 23 * Sep 6, 13, 27, awards, Oct 4, 11, stats. 18, ed. Nov 8, 15, Wood, cor. Dec 13-**89,** diplomas * Jan 9-**91,** *E & Min* * May 18 * June 1-**89,** *Genie Civil,* U. S. elec. exhibits, Hering *F Inst* Jan, May, June, metallur. arts at, Garrison, May, June * July, Aug * Oct -**90**; 1889, Machin. Hall erection, Henard, abs. *Inst C E* v 95 -**89** *Genie Civil* * v 13 -**88,** *R Gaz* May 17-**89,** *Sci Am* Feb 2, 2, Apr 20-**89**; 1889 *Sc Am Sup* * Aug 4-**88** * Feb 16 * Mar 30 * Apr 27 * May 25 * June 8, 15 * July 13 * Aug 17 * Oct 12, 26, awards, Nov 2, 9-**89,** *The Eng* Dec 28, 28-**88** * May 3, Eiffel tower * 10, 17, June 14 * Aug 2-16, awards, Oct 4-**89**

TASMANIA *Eng* Feb 6-**91**

U. S., World's Columbian, Chicago, 1893, *Am C E* Gov't building dome ironwork, McGuire, insets (full) * v 26-**92**; *Century* architecture, Van Brunt, May — Aug; Kirkland *Chaut* Dec -**92**

El Eng electricity at, Calkins * Nov 23-**92**; *El Wld* Electric. bld. plan (large scale) * Oct 24-**91,** electric. at * Aug, Sep, Machin. bld. * Oct 1, electric. at * Dec 3-**92**

Eng Dec 27-**89,** ed. Mar 7, Berger on Chicago, Wood May 2, Berger July 4, Oct 3, Dredge Dec 5, ed. 5, 12 * 19-**90,** Jan 2, ed. Feb 20 * 27, ed. Mar 27 * Apr 17 * May 1, inset 29 * June 5, inset 12, ed. 19, inset 26 * July 10, ed. 17, 24, inset 31, 31, ed. Aug. 7 * Sep 18, n * Oct 9, 23, 30 * Nov 6, inset 13 27, inset * Dec 4, 4, Dredge, inset 11, 11, 18, 18, 25-**91**; * Jan 1, Dredge, inset 8-29 * Feb 5-19 * Mar 4-25, inset * Apr 8-29 * May 6, Gov't. bld. 20, 27 * June 10, 24 * July 1-29 * Aug 5, Dredge, 12, Wood report, 19, 26 * Sep 2, cost of exhibiting, 9, 16, 23 * Oct 28 * Nov 11-25, Transport. bld. * Dec 2, 9, Dredge, Electric. bld. * 16-30, Dredge, 30-**92**

E Mag mechan. display, Atkinson, Apr; buildings, Freitag * Nov -**91,** Manuf's bld., greatest of all fair buildings., do. * July; and death rate of 1893, Bayles, Dec -**92**

E News original buildings, ed. Oct 5-**89,** novel plan, Jennison * Mar 15, ed. 29-**90,** vs. N. Y. City, ed. Aug 10, proposed N. Y. site for, ed. Sep 29-**89,** general plan * Mar 28 Sep * 26, birds-eye view * Oct 31, figures 31-**91** * Jan 16, n 23, 30, buildings, inset * Feb 13 * Mar 5, dome 12, 26, Apr 9 * 21, Mining

Exhibitions, U. S., World's Columbian
bld. inset * May 5, 12, 26, June 9, Mach. bld. inset * 30 * July 7, inset, 28, inset * Sep 1, 8, transportation * Oct 13, elec. R., inset * 20, cars, inset * Nov 17, Transport. bld. Dec 1, inset * 29-**92**

E Rec blds. * June 25 * July 9, insets * Aug 6, 13, 27 * Sep 17 * Oct 8-22, Machin. Hall details * Nov 19, 26 * Dec 24, 31-**92**; *F Inst* inset * May -**92**; blds. foundations and floors, Gottlieb *J Assoc E Socs* Dec -**91**; the designers of the fair (architects), pors., Millett *Harper's* * Nov - **92**

R Gaz Oct 3, 11, n Dec 6-**89** * Aug 7 * Sep 25-**91**, buildings * July 1, * Aug 26 * Sep 16, 23, * Oct 14; World's Congresses of 1893, Bonney, por. *Rev of Revs* * Oct -**92**; *Sc Am Sup* (full) Feb 15-**90**; Dredge (full) Jan 3, tower * Apr 4, * Aug 29-**91**; making of the white city, Bunner *Scribner's* * Oct; Chicago's part in, Mac Veagh, Nov; decoration of, Millet * Dec -**92**

The Eng * July 31 * Aug 14 * Sep 18, battleship Oct 16, regulations 16 * 23 * Nov 6, 13, 20, 27, 27 * Dec 25-**91** * July 1, 22 * Aug 12 * Sep 9, 23, general plan * Oct 28-**92**

Explosions from unknown causes, Bayles *Am Min* v 19-**91**, do. Green, v 20 -**92**; under water *Eng* * Mar 22-**89**; of dynamite on the schooner Parallel, Le Conte *R Gaz* Aug 2-**88**. See also BOILERS, explosions, etc.

Explosives, historical notes, Guttmann *Eng* Nov 8-**89**; expts., So. Wales mining, Sep 12-**90**; firing point table, n *E Mag* Apr -**91**; value of hydrocarbon explosives for mining, Walker *E & Min* Aug 11-**88**; modern, Deering, Feb 23; high, notes, Dec 28-**89**; use of in fiery mines, Nov 29-**90**

E News high, list of. Mar 31; and their composition, Foster, list, June 30, July 7-**88**, classification of, do. Jan 12, high, properties and use of, July 6-**89**; relative strengths of high, Walker, Jan 31-**91**; high, in warfare, Barber *F Inst* Feb -**91**; employment in presence of fire-damp, report, abs. *Inst C E* v 99 -**90**, *An Mines* v 14 -**88**; and ordnance material, Emmens, abs. *Inst C E* v 108 -**92**, *U. S. Naval Inst* pro -**91**; Deering *R Gaz* Feb 15-**89**

Sc Am Sup high and projectiles, Vreeland, Dec 1-**88**; Deering (full) May 18, *J. Soc Arts Lond;* recent develops. in high, Nursey (full) *Sc Am Sup* July 20, 27; notes, Hake (full) Oct 5-**89**; high, in warfare, Barber, May 21-**91**; Lippincott, Oct 1 -**92**; drying ap. in vacuum *The Eng* * Nov 27-**91**, July 1-**92**

Explosives, AMMONITE, expts. with *The Eng* July 17-**91**
AZOIMIDE (new sodium salt) *Sc Am Sup* Jan 9-**92**
BELLITE, expts. *Eng* Feb 8-**89**; *E & Min* Dec 1-**88**, *Iron*; Favier and Roburite *E News* Apr 25-**91**; Chalon, abs. *Inst C E* v 94 -**88**, *Genie Civil* v 13 -**88**; *Locom* Mar **89**; *Sci Am* Dec 1-**88**; *The Eng* Nov 9-**88**; expts. Feb 8-**89**
CAKE-powder, perforated, for ordnance, Quick, abs. *Inst C E* v 97 -**89**
CARBO-dynamite *Eng* Apr 20, *Sc Am Sup* May 19-**88**
EMMENSITE *E News* Feb 2-**89**, n *Sc Am Sup* Jan 7-**88**, *Am Engr*
GUN-cotton, hist., manuf., Rohrer *Sci Am* Feb 23-**89**
GUN-powder, blasting, form of crater produced by exploding in a homogeneous solid, Firmstone, insets *Am Min* * 18-**90**; smokeless *E & Min* July 5-**90**, *Industries*, do. *E News* July 5-**90**, do. expts. at Essen, abs. *Inst C E* v 100 -**90**; manuf., F. H. Robinson *Sc Am Sup* Dec 1-**88**; improvements in, Abel (full) Oct 18-**90**; smokeless, do. (full) Apr 12 * June 28, do., Helene (full) * Oct 4-**90**, do. Maxim (full) Sep 26-**91**
MELINITE disclosures, ed. *Eng* May 29-**91**
NITRATED manuf., Negrier furnace *Sc Am Sup* * Jan 30, May 21 -**92**
NITRO-cellulose manuf., Littlewood *Sc Am Sup* Dec 5-**91**
NITRO-glycerine and other, tests of relative strength, F. W. Clark *Am Min* * v 18 -**90**; manuf., Vuillaume *Sc Am Sup* * Apr 13 -**89**
ROBURITE, Favier and Bellite *E News* Apr 25-**91**
SMOKELESS powders. See EXPLOSIVES, gun-powders, smokeless
Extensometer, Johnson's *E News* * Aug 4-**92**
Extract concentrating ap. in vacuo, Adrian *Sc Am Sup* * May 25-**89**
Eye-bars, steel, tests, Lewis, discuss. *Am C E* * v 27-**92**; tests of full size, n *E News* * July 14-**92**
Eyesight, care of, Fox *F Inst* Sep -**91**, June -**92**, do. (full) *Sc Am Sup* Oct 3-**91**

Factory, elec. driving (full) *The Eng* Nov 25-**92**. See also MILLS
Falling bodies vel., of different spec. grav. falling in water, Richards-Woodward, insets *Am Min* * v 18 -**90**, do. insets *Tech Q* * May -**90**
Falshaw, James (full) *Inst C E* v 99 -**90**

Fans, Walker anti-vibration reg. shutter or slide for, Guibal, and other enclosed fans, Walker *Am Min* v 19 -**91**; Capell, at Berge-Borbeck, Kattwinkel, abs. *Inst C E* v 103 -**91**, *Zeit Berg* -**90**. See also BLOWERS

Faraday centenary *Sc Am Sup* * Aug 1-**91**; chem. works of in relation to mod. science, Dewar, May 14-**92**; centenary, Royal Inst. pro. *The Eng* * June 26-**91**

Farey, Barnard W. *Inst C E* v 94 -**88**

Farmer, what the Gov't. is doing for the, Harris *Cent* July -**92**

Farrar, James *Inst C E* v 98 -**89**

Faucet, an indestructible, W. Thomson's *E News* * Sep 19-**91**

Feed water heaters. See BOILERS, feed water heaters

Felton, Samuel M. *R Gaz* Feb 1-**89**

Fermentation industries, chem. and bacteriology, Frankland *Sc Am Sup* * Dec 3, 10-**92**

Ferranti and his work *El Wld* * Jan 2-**92**

Ferro-silicon and econ. of its use, Keep *Eng* Jan 11-**89**

Ferry-boats, the 'Bergen' steam double screw str., Hoboken, Stevens-Denton *Am M E* * v 11; *Eng* * Feb 21, 21; performance, do. *R & Eng* Mar -**90**; *R Gaz* * Aug 9-**89**; *Sci Am* Dec 8 -**88**; *Sc Am Sup* * Nov 1-**90**

BREMEN, screw *Eng* * Feb -**92**

'CINCINNATI,' screw, Penn. R., inset *E News* *Nov 7, inset *R Gaz* * Nov 6-**91**

ELEVATING platform *Sc Am Sup* * Oct 12-**89**

FINNIESTON elevating deck str. *Eng* * Sep 5, *Sc Am Sup* * Nov 15-**92**

FREIGHT car transfer, Penn. R., Jersey City, inset *E News* * Jan 18, 18-**90**

GREENWICH steam, Thames river *Eng* * Feb 17 * July 20, *Sc Am Sup* * Mar 24-**88**, * Dec 31, *The Eng* * Dec 2-**92**

HOBOKEN, Gannon *R & Eng* * Feb -**92**. See also Ferry-boats, 'Bergen'

'MERSEY' str., Liverpool *The Eng* * Oct 23-**91**

MICH. Cen. R. steel str. *R & Eng* * Feb, *R Gaz*, *Sc Am Sup* * Feb 23-**89**

'SOLANO,' Cen. Pac. R., Harris, insets (full) *Am C E* v 22 -**90**

'TRANSFER,' Can. So. R., engines, inset *Eng* * Mar 21, *Sc Am Sup* * May 10-**90**

Ferry-house, Barclay st., N. Y. *E Rec* * Nov 24-**88**

Fertilizers, trade report, Terne *F Inst* Dec -**92**; relation to

Fertilizers
fruits, Austen *Sc Am Sup* May 25-**89**; fertilizing materials, Voorhees, May 3-**90**; (full) June 13-**91**; artif, W. S. Allen *Soc Arts Mass* -**89**

Fibre testing instrum., Boys *Eng* * June 21-**89**; textile fibres and fabrics, exam, Schlichter (full) *Sc Am Sup* * May 17-**90**. See also LIME sulphite fiber manuf.

Field, Cyrus W., por. *El Rev* * July 23-**92**

Field, Stephen D., por. *El Wld* * Dec 28-**89**

Figures, curiosities in *E News* Dec 29-**88**. See also ARITHMETIC

Finance, Inst. of Actuaries, Text-book of Prins. of Interest, Life Annuities and Assurances, King, bk., C. & E. Layton, Lond '87; English currency commissions arguments *E & Min* Nov 24-**88**

Finland, canals, roads and railroads of. See CANALS, Finland.

Fire alarms, Denio system *El Eng* * Oct 5-**92**; the Rogers auxil. *El Wld* * Oct 13-**88**; Gaynor system * May 11-**89**; N. Y. service, n * Nov 28-**91**

Fire-boats, N. Y. city *E & Min* Apr 12-**90**; Cowles, abs. *Inst C E* v 92 -**88**, *Am M E* -**87**, for City of Chic., do. *The Eng* Dec 21-**88**

Fire, Chicago, Kirkland *N E Mag* Aug -**92**

Fire-clays, Am., analyses, table *Sc Am Sup* May 31-**90**. See also REFRACTORY materials

Fire Commission, Howes, Fitzgerald, Fry report, description of depts., N. Y., Chic., Phila., Balt., Cincin., fire losses, table, etc. *Boston Herald* Mar 4-**90**

Fire-engine, Dewey's *El Rev* * Mar 7-**91**. See also STEAM fire engines

Fire extinguishers, Lufkin's elec. method *El Eng* * Sep 3-**90**; Carver's ap. July 7 * Sep 7-**88** * Feb 15-**89**; water required, ed. Dec 20-**90**, do. *E Rec* Jan 10-**91**; extinguishing, Woodbury, cor. *E News* Jan 11-**90**; Hexamer's, for malt mills, com. report, n *F Inst* Apr -**89**; Mackey aut. *Sci Am* Nov 3-**88**; Met. fire brigade, Lond. *The Eng* Feb 3; Douse's aut. fire-check, Nov 23-**88**

HOSE, linen, quality of *E News* Mar 23-**89**. See also FIRE streams

HYDRANTS, det. of rental value of, Tubbs *E News* May 5-**88**; and valves, new types, Stillwell manuf. Co. * Mar 29; Eddy Valve Co. * Oct 4-**90**

Fire INSURANCE and elec. interests, relations between, Barton *El Eng* May 28, do. *El Wld* May 31; Assoc., Factory Mut. results *E News* Sep 22-**88**; Bost. Manuf's. Mut. Co's report, n Mar 23-**89**; rules and elec. lighting, Hartwell *The Eng* Dec 5-**90**. See also ELEC. insurance, etc.

ISLAND inlet, is it moving E. or W., Haupt, map *F Inst* * Apr -**89**

LONDON stats. *El Rev Lond* Jan 18-**89**; and fire telegraphs, Feb 5-**92**; Met. fire brigade *The Eng* Feb 3-**88**

LOSSES, methods of reducing, Woodbury *Am M E* * v 11 -**90**, do. *Cassier's* * Nov * Dec -**91**, do. *E News* * Dec 14-**89**; and timber supply, diag., ed. Jan 19-**89**; table, etc., Fire Commission report *Bost. Herald* Mar 4-**90**; in U. S., 1875-'87, the Chronicle Fire Tables for 1888, bk., Chron. Co., N. Y. *F Inst* Sep -**88**, do. for 1890, bk. notice *E News* Sep 20-**90**

NEW York alarm service, n *El Wld* * Nov 28-**91**; dept. *Sci Am* Feb 16-**89**

Fire-place and stove effic., Lunge *The Eng* Sep 6-**89**, *J Soc Chem Ind*

Fire-proof doors *Eng* July 12-**89**; floors, diag. for det. size and wt. of steel beams for *E News* * Apr 28-**92**; fire-proofing, Martin proc., Beardsley *F Inst* Jan -**88**; construct., Webster, insets (full) *Inst C E* * v 105 -**91**. See also BUILDINGS — FLOORS — PAINTS, fire-proof

Fire, protection from, hazards from electricity, Woodbury *El Eng* Nov 18, 25-**91**; rules for elec. wires *El Rev Lond* Apr 13, June 1-**88**; elec. fires, Barton *El Rev* Oct 4-**90**

Eng fire-proof doors * July 12-**89**; elec. lighting dangers, Ferranti * Jan 3, 10-**90**; slow burning construct., Woodbury, Apr 10-**91**; risks on tall office buildings, Atkinson *E Mag* May; ceilings, comparative value of different *E News* Apr 7-**88**; metallic lathing and ed. * Dec 7, 7; expert opinions on, 14-**89**; aut. sprinklers, Apr 28-**92**

E Rec prevention, Chatterton, abs. * Sep 7, 14-**89**; resisting construct., Woodbury, Jan 24; prevention and relation of building inspection, do. 31, Feb 7, 14; resisting materials tests, Boston * Oct 24; hazards for electricity, Woodbury, Dec 19, 26-**91**; distrib. mains, Fanning, May 21, 28-**92**

F Inst Paris and Am. cities — Phila., Boswell, Feb -**90**; elec. lighting of danger buildings, Jenkin *Inst C E* * v 110 -**92**; electricity as applied to, Lufkin *Sc Am Sup* * Oct 25-

Fire protection
90; Woodbury, Mar 14; portland cement as a material, Monier's new use for *The Eng* Nov 27-**91**. See also ELEC. ins.—lighting rules, etc.; FIRE sprinklers; LOCOMOTIVE fire extinguisher
PUMPS, steam, Alburger *Cassier's* * Mar -**92**. See all STEAM pumps
SERVICE and distrib. mains, Fanning *Cassier's* July, Aug, do. *E News* * July 14, do. *E Rec* June 4, arr. of hydrants and water pipes, July 16, 23, Aug 6-**92**. See also FIRE, Lond — Losses — N. Y.
SPRINKLERS, aut. *Eng* May 4; Draper-Hetherington aut. * Nov 16 *The Eng* Mar 9-**88**; aut. *E News* Apr 28-**92**. See also SPRINKLERS
STREAMS, expts. relative to the hydraulics of, Freeman, and discuss., insets (very full) *Am C E* * v 21-**89**, pph. do. Nov -**89**, do. *E Rec* Jan 4 * Feb 1, 22, Mar 8, Apr 26, May 3-**90**, do. abs. *Inst C E* v 101 -**90**; distrib. mains *E News* July 21-**92**
TELEGRAPHS and stats. (Lond.) *El Rev Lond* Feb 5-**92**; Truenfeld, Mar 16-**88**
Fires in cities, conflagrations, Woodbury *F Inst* Aug -**91**; prevention and extinction, Chatterton *Inst C E* * v 93 -**88**; in theatres, abs. v 94 -**88**, *Tech Blatter* v 20 -**88**; peculiar origin of *Sc Am Sup* Feb 14-**88**, *Eng*
Fish, displacements and area curves of, Parsons *Am M E* * v 9-**88**
Fisher, George *Inst C E* v 107 -**92**
Fishery question, No. Am., Linzee *Tech Q* Feb -**90**
Flame and smoke, expts., Fletcher *Sc Am Sup* Jan 26; on flame, Rowan (full) June 8-**89**, *J Chem Indus*; structure and chem. of, Smithells, *Sc Am Sup* Apr 16; influence of air on illum. of flames, Bunte, June 4, *Chem Tr J*; illuminating, Lewes *Sc Am Sup* July 9, hydrocarbon, luminosity, do. Apr 2, Oct 15-**92**
Flax culture, and preparation, Stewart *Sc Am Sup* Jan 10-**91**; Monie * Feb 23-**89**, *Industries*
Fleming, John A., por *El Wld* * Nov 8-**90**
Flood gates, aut., Czvetkovics *Eng* * July 13-**88**
Floods, Ravine du Sud, Hayti, averting overflow, Crowell, and discuss., insets, So. Fork dam failure, com. report, insets *Am C E* * v 24 -**91**; effects in western rivers, Going *E Mag* Sep -**92**
E News through the failure of natural barriers, July 27; Johnstown, Pa., disaster * June 1, ed. 8, and South Fork dam,

Floods
and ed. 15, 15, ed. 22; map of district * July 13 * Aug 17-**89**; of June, 1889, West branch Susquehanna river, Pa. * Feb 14-**91**, do. report, Raymond *E Rec* Jan 23-**92**; Johnstown * June -**89**; in Germany, causes of, Niles *Soc Arts Mass* -**88**; prevention and control of rivers, Robbins *Tech Q* Sep -**87**; discharge from small watersheds, Porter, inset * Dec -**91**; Johnstown *The Eng* Aug 30-**89**

Floors, fire-proof construct. *E News* * May 23 * July 4, Wilson, cor. * 25, Equit. bld., Denver, Col., three systems, Hawks * Aug 29, hollow arch-blocks, test, Cutshaw * Nov 14-**91**; fire-proof, diag. for det. size and wt. of steel beams for * Apr 28; a monolithic beton-concrete, n * May 5-**92**; World's Fair blds., Chic. *E Rec* Dec 5-**91**

Flour mills, roller milling, Simon *Eng* * Apr 12, 19-**89**, insets (full) *Inst M E* * Jan -**89**, *Sc Am Sup* Mar 16-**89**; methods, Gibson, *Sc Am Sup* Mar 3; risks and appliances, Arndt, Aug 4-**88**; mod. products, distrib. of phosphorus and nitrogen in, E. Richards *Tech Q* Aug -**90**; machine, Robinson's *The Eng* * June 7-**89**

Flower, James J. A. *Inst C E* v 95 -**89**

Floyer, George W. *Inst C E* v 103 -**91**

Fluorine, isolation of, Tutton *F Inst* Apr, *Sc Am Sup* Jan 28-**88**, *Nature;* researches on, (full) do. *Sc Am Sup* * Dec 12-**91**

Flying, mechan. flight, Langley *Cosmop* May; the aeroplane, Maxim, June -**92**; machines, expts., Hargrave *Eng* * June 6, compressed air * Dec 26-**90**; expts. in aerodynamics, Langley, bk. review, Nov 20, Vogt, cor. Dec 4-**91**

E Mag air nav. prog., Chanute * Oct -**91**; human, suggestions, Kirk * Feb -**92**; machine, latest, ed. *E & Min* Jan 11-**90**; the problem of, ed. *E News* Aug 31-**89**, Jan 31-**91**; an aeroplane diagram, Hastings * May 5-**92**

R & Eng machines, Maxim, Jan, June, July; soaring of birds * Mar; Ader's, n * Sep; mechan. flight expt. researches, Langley, Sep; machines, prog. in, Chanute (full) * Oct **91** – Dec -**92**, etc.

Sc Am Sup flight of birds, n * Feb 1-**90**; the Maxim machine * Aug 22; mechan., experimental researches, Langley, 29 -**91**, do. Oakes * July 30, aviation, Renard * 30-**92**; reaction of air on planes, Lancaster, cor. *The Eng* * Mar 7; Quartermain, cor. Oct 17-**90**; the Maxim machine * July 17-**91**. See also AIR nav.

Fly-wheels, Armer, cor. *Eng* Oct 30-**91**; band strains in rims, Stanwood *E News* * Dec 8, *Am M E* * v 13 -**92**

Foam, Rayleigh (full) *Sc Am Sup* * Aug 23-**90**

Fog-signalling ap., Paris exhib. *Eng* * Oct 18-**89**; aut. marine, Berkeley *Sc Am Sup* * Sep 15-**88**; ap. for elec. light in light-houses, see LIGHT-houses, fog

Force, action of, mod. views and conception of the ether, Stanley *El Wld* Apr 16-**92**; and energy, a theory of dynamics, G. Allen, bk. n *F Inst* Mar -**91**; principle of, demonstration of existence of atom, Maxim *Sc Am Sup* May 11-**89**. See also ENERGY

Forestry interests of U. S., n *E News* May 31-**90**; development of, in Europe, Raynor *Lehigh Eng J* June -**88**; forests of U. S. *Sc Am Sup* Oct 6-**88**; practical, Lyman, July 2-**92**

Forging, hydr. and flow of solids, C. Sellers *R Gaz* Feb 7-**90**, Dec 25-**91**

MACHINE, spike, the Burton system *El Eng* * Jan 27-**92**, *El Rev* * Sep 13-**90**; hydr. machines and steam hammers, C. Sellers *R Gaz* Aug 2-**89**; Gould's * Feb 7-**90**. See also STEAM hammers

PRESSES, W. Allen *Cassier's* * Feb -**92**; hydr., do. *Eng* * Oct 9, do. *R & Eng* * Dec, do. *Sc Am Sup* * Nov 14-**91**; Daelen, Demenge, abs. *Inst C E* v 108 -**92**; hydr., French large *R & Eng* * Feb -**92**. See also STEAM hammers, Chomienne *R & Eng* Aug -**89**

Forgings, rolled, Gould machine *R Gaz* * Feb 7-**90**

Forge (shop), Cen. engine works, W. Hartlepool *The Eng* * Feb 7-**90**

Fortifications, and gun-cotton shells *Eng* June 15, 22-**88**; fortress defence, ed. Jan 25-**89**; metallurgical arts, Paris exhib., Garrison *F Inst* * July * Aug -**90**; China, scientific, Dowdall, n *Inst C E* v 99 -**90**; hydrostatic disappearing turret *Sc Am Sup* * July 14, do. French * Aug 25-**88**; the Mongin oscil. cupola, French *The Eng* * Nov 29-**89**. See also GUNNERY and armor

Foundations, experiences, notes, Boller *Am C E* * Oct 27-**92**, do. *E News* July 28-**92**; crushing strength of materials, Baker, table, cor. Jan 5-**89**; Collingwood, Feb 14, 21-**91**, do. *E Rec* Mar 30, Apr 6-**89**, Feb 21, 28-**91**; new method for, R. L. Harris pat. *Sc Am Sup* * Oct 1-**92**. See also BRIDGES; BUILDINGS; CEMENTS; CONCRETE; DAMS; HARBOR eng; LIGHT-houses; PIERS; PILING; QUICKSAND, dealing with; WATER-works, etc.

Foundations, ANCHORING bolts, adhesive strength of sulphur, lead and portland cement for, *E News* July 19-**90**
BUILDING, steel for, Chic., Purdy, inset *E News* * Aug 8-**91**
CITY Hall, Kansas City, Mo. *E Rec* * Apr 2, 16-**92**
COFFER-dam or caisson without timber or iron in its construct., R. L. Harris *Am C E* Mar -**91**, *E News* Mar 7-**91**, abs. *Inst C E* v 105-**91**; and floating caissons, R. Hunt (full) *E Rec* * Feb 7-**91**
DALY College, Indore, India, Litster, abs. n *Inst C E* v 97 -**89**
DREXEL office bld., Phila. *E Rec* * May 11-**89**
GAS holder tanks, Bay State Gas Co. *Am C E* * Oct 27-**92**
PARIS, consolidation of *Sc Am Sup* * Oct 25-**90**
PILE, on rock *E Rec* * Apr 11-**91**; World's fair blds. *R Gaz* * Oct 14-**92**
SINKING deep, prog. in, Ormbsy *E News* Feb 1; an experience in, May 31-**90**; *E Rec* * Jan 18, 25: Burge *Sc Am Sup* * Jan 25-**90**, prog. in, for eng. works, do. *The Eng* Dec 20-**89**
SUBAQUEOUS, Shield *Eng* * Sep 16-**92**; Kinipple * Oct 10, 31, inset * Nov 21 * Dec 26-**90**, do. *E News* * Nov 8-**90**, Jan 17, 24-**91**; concreting under water, H. White, Dec 20-**90**
SUPPORTING power of soils, R. Hunt, table *E News* June 16, *E Rec* June 23, abs. *Inst C E* v 94 -**88**, *J Assoc E Socs* -**88**, *Sc Am Sup* June 30 -**88**
UNDERPINNING by means of grouting and stock ramming, Kinipple *Eng* * May 20, 27, *Sc Am Sup* * Sep 17, 24-**92**; Great Yarmouth Town Hall, Duckham, inset *Inst C E* * v 98 -**89**
VAULT walls and roof proportioning *E Rec* * June 14-**90**
WORLD'S Columbian exhib., Chic., Gottlieb *Eng* Dec 4; and floors *E Rec* Dec 5-**91**; pile *R Gaz* * Oct 14-**92**

Foundry, work, es. cost of, Fowler, effect of adding wt. iron or steel, Morgan, discuss., best molds for steel castings, do., best pig iron for light castings, Towne, discuss. *Am M E* v 9 -**88**; cupola experience, Scheffler * v 9 -**88**, v 10 -**89**
Eng the Stewart 'Rapid' cupola furnace * Dec 5-**90**; Archdale & Co., Birm., England * Sep 18-**91**; cupola fur. construct. for melting pig iron, Gouvy, Durfee *E & Min* * Feb 16, 23 * Mar 9, 16, 30-**89**; the Worthington plant, Elizabethport, N. J. (full) *E Rec* * Apr 2-**92**; mechan. treatment of moulding sand, Bagshaw; insets *Inst M E* * Jan -**91**; iron foundry, Master's *Sci Am* Oct 20-**88**; moulder's tools *Sc Am Sup* * Mar 10; Gov't. plant for New So. Wales *The Eng* Sep 14, 21, Oct 5, 5, 12-**88**; railroad locomotive construct. Apr 22 * May 6, 20-**92**

Fountains, luminous, Paris exhib. *Eng* * June 7 *Sc Am Sup* * July 20, ap. (full) * Dec 7-**89**

Fowler, John, por. *Eng* * Feb 28-**90,** *Inst C E* v 95 -**89**

France, navy *Eng* June 6-20, 'Amiral Baudin' * July 4 * Aug 15 * Nov 14 * Dec 12-**90** * Feb 20 * July 24 * Aug 7, inset, 14, 28 * Oct 9, 30 * Dec 25-**91**; geodetic work *R & Eng* Aug -**89**; naval manœuvres *The Eng* July 25, Aug 1, 8, 20 years of naval construct. Oct 17, Nov 14-**90**; inland nav. in, Oct 7-**92.** See also NAVIES; PARIS and under subjects

Francis, James B., por. *E News* * Sep 22-**92**

Francis, William *Inst C E* v 95 -**89**

Franklin, Benj., por., first balloon voyage *Sc Am Sup* * June 9-**88**; kite expt., M'Adie *El Wld* * Aug 15-**91**

Franklin Institute, Phila., pro., list members *F Inst* Jan -**89,** Mar -**90**

Fraser, Henry J. *Inst C E* v 100 -**90**

Free-trade and protection, Marshall, competition *Eng* Sep 19-**90.** See also CAPITAL and labor

Frend, William A. *Inst C E* v 98 -**89**

Frick, Henry C., por. *E & Min* * Dec 19-**91**

Frick Co's shops *R & Eng* Oct -**92**

Friction, of a collar bearing *Eng* * May 11, 11-**88**; of a pivot bearing, expts., report, Mar 27-**91**; influence of elec. cur. on sliding surfaces, Schmidt *El Eng* * July 16-**90**; diag., do. *E News* * Sep 27-**90**; recent researches in, Goodman, Mar 31, Apr 7, 14, laws of frictional resist., ed. 7-**88**; phenomenal, Cooper, n *F Inst* May -**91**

Inst C E new theory of, Petroff, bk. review, Leipzig, '87, v 95 -**89**; expts., com. report, insets (full) *Inst M E* * May -**88**; pivot friction, insets * Mar -**91**; Conti's laws of sliding, Merriman *R Gaz* June 14-**89**; phenomenal, Cooper, n May 8, C. Sellers, cor. 15-**91**; expts., Inst M E com. report *The Eng* May 4; of metal coils, H. & E. Shaw, Sep 28-**88**; and lubrication, Webber *Tech Q* * May -**88.** See also LUBRICATION

Fritz, John *R Gaz* Oct 7-**92**

Frome, Edward *Inst C E* v 101 -**90**

Fuels, energy and util. of solid, liquid and gaseous, notes, Taylor *Am Min* v 18 -**90**; U. S. supply, Birkinbine, v 20 -**92**; fuel and its effic., notes, Thwaite, *Eng* * July 1, 8; newer forms of, Paul *E Mag* Jan -**92**; fossil, of Ill. Comstock, cor. *E & Min* May 25-**89,** July 9-**87**; fuel and combustion, notes on, Buel

Fuels
(full) *R Gaz* * July 13, 27, liquid * Nov 2, 30–**88**; calorific value of, M. A. Jones *Sc Am Sup* Aug 10; of future, Sep 28–**89**; fuel testing station for Lond., proposed, Donkin, cor. *The Eng* June 15–**88**. See also COMBUSTION; FURNACES; HEAT
BAGASSE as fuel, Becuel *Locom* May, *Sc Am Sup* Apr 16–**92**
CALORIMETERS for testing. See CALORIMETERS
CULM compared with other *E News* Dec 6–**90**
GASEOUS, Bell *Eng* Sep 27–**89**; fuel gases, classification, Wurtz *E & Min* * July 20–**89**; fuel-gas and applics., Loomis *Am Min* * v 19 –**91**, do. *E News* * Oct 11–**90**; use of liquid and gaseous, Gardner, Apr 27–**89**; fuel-gas values, Emmens, Oct 20 –**92**
LIQUID, oil, petroleum, Leonard *El Eng* Mar, Francisco, Ransom, abs. Mar, *El Rev* Mar 9, *El Wld* Mar 2, 2–**89**, *R & Eng* Nov –**88**; petrol., Garratt *El Wld* Sep 8–**88**; use of liquid and gaseous, Gardner *E News* Apr 27–**89**; oil, Dudley *F Inst* * Aug –**88**; Aerated Fuel Co's system of burning oil by compressed air, Collins * Oct –**92**; Chomienne *R & Eng* Feb –**92**; and combust., notes, Buel *R Gaz* * Nov 2, 30–**88**
Sc Am Sup value of oil as, Dudley, abs. Oct 13–**88**; advantages, Ransom, Apr 20–**89**; oil-firing, Reynolds * Aug 20–**92**; for gas retorts, Drory's ap. *The Eng* Sep 7–**88**. See also COAL; GAS; LOCOMS., petrol. fuel; OIL; PETROLEUM
PRESS, Steven's *Eng* * Sep 5–**90**

Fulton, Arthur R. W. *Inst C E* v 99 –**90**

Fulton, Robert, Fulton night at the engineers, Holloway *E Mag* Dec –**91**

Furnaces, terms, a glossary of in English, French and German, Egleston *Am Min* * v 16 –**88**. See also BLAST — CREMATORY — GAS — TAR furnaces; BOILERS; FLAME; LOCOM. boilers; MARINE boilers; SMOKE consuming, etc.
ANNEALING, R. I. Locom. works, Prov. *R Gaz* * Feb 7–**90**
BOILER, the steam-jet for preventing smoke *E News* * Apr 4–**91**; the Hawley down-draft, 250 h. p. Heine * Jan 30–**92**
CREMATOR, Foster's garbage and refuse *E News* * Mar 2–**89**. See also CREMATORIES
CUPOLA, the Stewart 'Rapid' *Eng* * Dec 5–**90**; construct. for melting pig iron, Gouvy, Durfee *E & Min* * Feb 16, 23 * Mar 9, 16, 30–**89**. See also BLAST furs; FOUNDRY

Furnaces, DRAUGHT, draft gauge, Barrus' *E News* * May 24 -**90**; forced draft, Williams *The Eng* Nov 22, 29-**89**. See also MARINE boilers

ELECTRIC, early forms, Houston *F Inst* Sep -**88**

FALES' hot air *E News* Apr 13-**89**, Mar 22-**90**

FLUE gases *Eng* * Oct 3, 10-**90**

GAS, regenerative, F. Siemens, cor. *Eng* Aug 9 -**89**; Dawson, Feb 6 * Apr 24 * May 1-**91**. See also FURS., Siemens'

GRATES, Hopcraft rotative *E & Min* * Apr 13, *Sc Am Sup* * Apr 6 *The Eng* * Mar 22-**89**; Godillot's step grate for poor fuels, Brüll, abs. *Inst C E* v 98 -**89**, *Bul Soc Encour* June -**89**. See also GRATES

HEATING, Nicholson *Am M E* * v 11 -**90**; and melting, machin. for charging, Wellman, insets *Am Min* * v 19 -**91**; Siemans, Smith *E News* * May 24-**90**; for re-heating steel plates, using re-generated producer gas, Loomis proc. * Oct 11-**90**

HOPCRAFT rotative boiler fur. *E & Min* * Apr 13 *Sc Am Sup* * Apr 6 *The Eng* * Mar 22-**89**

LIQUID fuel burning *The Eng* Feb 10, 24, Mar 9, 23, Apr 20, construct. June 8, July 13, Oct 19-**88**

SIEMENS' new form, Akerman *Eng* Sep 26-**90**; Head * Oct 11-**89**, May 9-**90**, *E & Min* * Nov 9-**89**, *Iron & Steel Inst*, (full) *Sc Am Sup* * Mar 15-**90**; calorimetric study of, Despret, abs. *Inst C E* v 103 -**91**, *Rev Mines* v 11 -**90**

SMOKE consuming, Hopcraft's rotative boiler fur. *E & Min* * Apr 13, *Sc Am Sup* * Apr 6, *The Eng* * Mar 22-**89**. See also BOILERS, down-draft; SMOKE prevention

Galvanism, electricity, magnetism and the telegraph, chronol. hist., Mottelay (very full) *El Wld* * Apr 18 – * Dec 26-**91**, Jan 2 – Feb 27, Sep 3, pors. 10 – * Oct 22 – Dec 31-**92**, etc.

Galvanometers, pocket, Tanakadate (full) *El Eng* * Nov * Dec -**88**; standard ballistic * Nov 16-**92**; Taylor's *El Rev Lond* * June 15-**88**; Ayrton, Feb 7-**90**; reflecting, Bishop *El Rev* Nov 28 * Dec 5-26-**91**, Jan 2-30, Feb 13-**92**; Thomson correction of error table, Kennelly *El Wld* Apr 13; Weston tangent * 20-**89**; d'Arsonval imps. * Mar 12; ballistic, Willyoung *F Inst* * Dec -**92**; how to make, Hutchins *Sc Am Sup* * Jan 14-**88**; for projection, Moore * May 4-**89**; universal dead beat, d'Arsonval * June 15-**89**; galv. coil correction factor, Skinner *Tech Q* * Sep -**87**. See also ELEC. galvs.

Gallwey, Lionel P. P. *Inst C E* v 107 -**92**
Galwey, William St. John (full) *Inst C E* v 109 -**92**
Garbage and town refuse disposal, Foster *Eng* * Dec 18-**91**; crematories, Kilvington *E Rec* Feb 23-**89**. See also CREMATORIES; MUNIC. eng.
Garland, Thomas B. *Inst C E* v 109 -**92**
Garrett, Gilbert H. *Inst C E* v 97 -**89**
Gas, and elec. light Commission, Mass., report *El Eng* Apr 23-**90**, Apr 1-**91**; vs. steam power *Eng* * Apr 17, Dowson's, ed. Dec 11; and electricity, comparative cost, ed. July 10-**91**; carburetting of, Lewes, June 24-**92**; and electric., relative cost, Humphreys *E Mag* Nov -**92**; illuminants in coal gas, Norton *Tech Q* May -**89**
BERLIN, and water supply, Leonhardt, abs. *Inst C E* v 92 -**88**, v 101 -**90**, *Gesund Ing* -**88**, May 1-**90**
BUENOS AYRES supply, Stevenson *Inst C E* v 103 -**91**
BUOY, steel *The Eng* Sep 13-**89**
BURNERS, effic., expts., Bouvier *Eng* Mar 15-**89**
CANNEL, ed. *The Eng* Sep 23-**92**
COAL, petrol. as an enricher of, ed *Eng* July 15-**92**; scrubbing, condensing and washing of, Key *Sc Am Sup* * Oct 6-**88**; *J Gas Lting;* illum., price of *The Eng* Apr 6-**88**; illuminants in, Norton *Tech Q* May -**89**
COMPANIES and incand. elec. lighting, Day *El Eng* May; future prospects, T. Wood *Sc Am Sup* June 2-**88**
COQUEREL plant, Vitoux, abs. *Inst C E* v 105 -**91** *Genie Civil* * v 19 -**91**
ENGINES, duplex, Sperry *El Eng* * Sep 17, do. *El Rev* * Sep 20, do. *El Wld* * Sep 20, do. *E & Min* * Sep 20-**90**; Crystal Pal. Elec. exhib. *El Rev Lond* * Feb 12, 19 * Mar 14-**92**; oil and steam engines *Eng* June 26; 30 h.p., Frankfort Elec. exhib. * July 3, 25 h.p. do. * Nov 13; 16 h.p. * July 31-**91**; econ., ed. Feb 12-**92**, do. n *E Mag* July -**91**
F Inst Paris exhib., Hering, May -**90**; Delamare-Deboutteville, insets (full) *Inst M E* * July -**89**, do. (full) *Sc Am Sup* * Sep 14, 21; 100 h.p. * Dec 21-**89**
The Eng Nottingham Show, July 13: regenerative, Nov 9 -**88**; combustion in, Ebbs * June 28-**89**; 100 h.p., Paris exhib. * Jan 10; effic. of, Miller * June 13 * July 25, Aug 29-**90**; Crystal Pal. exhib. * June 3-**92**
ACME, M'Ghee & Burt's *The Eng* * Apr 4-**90**

Gas ENGINES, AJAX single-acting, tests, Jamieson, report *The Eng* * Aug 9-**89**
ATKINSON'S cycle *El Wld* * June 6-**91**, 6 h.p. *Eng* * Dec 28 -**88** * Feb 22, com. report *F Inst* * June -**89**, *Pwr* * June -**91**, 6 h.p. and pump *Sc Am Sup* * Feb 9-**89**, * June 27. *St R J* * June, *The Eng* * July 3-**91**
BECK, the *Eng* * May 4, 11, tests, Kennedy *E News* June 9, *The Eng* May 4, 11-**88**
CHARTER, the *Eng* * Feb 10-**88**
CYCLE, the, Ransom, insets *Inst C E* * v 109 -**92**. See also GAS engines, Atkinson's
FORWARD, the *Eng* * Mar 8, 8, *The Eng* * Apr 5-**89** * July 11 -**90** * Aug 21-**91**
GRIFFIN, the *Eng* * Apr 13, June 1, *The Eng* May 18, 25, June 1-**88**
OTTO, test, Kidwell *F Inst* Feb, Spangler, abs. *Inst C E* v 100 -**90**
PALATINE *The Eng* * Dec 30-**92**
ROBEY'S *The Eng* * Oct 14-**92**
ROLLASON, the *Pwr* * Oct -**91**
ROOT'S *Eng* * Feb 5-**92**
SIMPLEX, 100 h. p., trial *El Wld* June 6-**91**, *El Rev Lond*, *Eng* July 12, Deboutteville * Aug 2, 9, 100 h. p., Paris exhib., inset * Sep 27-**89**, tests, Witz * Apr 17-**91**, Debout. *The Eng* * Aug 16, 23-**89**
SINTZ, the *El Wld* * Dec 5, *Pwr* * Dec -**91**
SPERRY'S duplex *El Eng* * Sep 17, *El Rev* * Sep 20, *El Wld* * Sep 20, *E & Min* * Sep 20-**90**
STURGEON, the *The Eng* June 15-**88**
TRUSTY, the, Wehman's *The Eng* * Oct 2-**91**
FUEL-gas, notes, Goetz *Am Min* * v 18 -**90**; Loomis proc., Oakman *Eng* Aug 1 * 22, do. gen. plant *E News* * Oct 11, do., insets *Inst M E* * July -**90**, and applics., do. *Sc Am Sup* * Nov 1-**90**; furnace, Archer combination *E & Min* * Mar 1, June 14-**90**; manuf. fuel-gas for heating, Christian, and ed. *E News* May 30, 30-**91**; production, Kitson's method * May 26-**92**, do. *F Inst* Dec -**91**; impracticability of util. coal gas for fuel, Merkle *Lehigh Eng J* Apr, expts. with mixture of three gases, do. June -**89**; and incand. gas lighting, Lungren *Sc Am Sup* Mar 3-**88**, *Light, Heat and Power*

Gas FURNACES, valves for, Wailes *Eng** June 10-**92**; the Thwaite contin. recuperative *E & Min* * Apr 26-**90** * *The Eng;* Dawson, discuss., insets *Inst M E* * Jan -**91**, *The Eng* Feb 6-**91**. See also FURNACES, gas

GLASGOW works *Eng** Jan 17, inset * 24 * Feb 7, inset * Mar 7-**90**

HEATING, manuf. of fuel-gas for, Christian, and ed. *E News* May 30, 30-**91**

HOLDERS, tanks repairing, Sherman *E Rec* Mar 14-**91**; (large) of Consol. Gas Co., N. Y. *Sci Am* Oct 27; without upper guide framing, Newbigging *Sc Am Sup* * Oct 20, *J Gas Lting*, do. cor. *The Eng* Sep 14-**88**

INSTITUTE pro. *Eng* June 27-**90**

LAMP, Harcourt's Pentane standard, tests, Clifford *El Rev* July 19-**90**, *Tech Q*

LEAKAGE, Nettleton *Sc Am Sup* Dec 5-**91**

LIGHTING, centenary of *Eng* July 29-**92**; incandescent, MacKean *E & Min* May 16-**91**, *J Soc Chem Ind;* st., Kan. C., cost of *E News* June 28-**90**; history *E Rec* May 9-**91**; Paris exhib., hist. of artif. illum., report (full) *Sc Am Sup* Oct 22, 29-**92**; by incandescence, Shapleigh (full) * *Soc Arts Mass* -**89**

LONDON, and coal trade of, ed. *The Eng* Sep 20-**89**

LOOMIS proc., gen. plant, Oakman *Eng* * Aug 1, 22, *E News* * Oct 11, insets *Inst M E* * July -**90**, and applics. *Sc Am Sup* * Nov 1-**90**

MOTORS, Witz's expts. *Sc Am Sup* Apr 25-**91**; Lalbin's 3-cyl. * Apr 12-**90**, *Genie Civil.* See also GAS engines

NATURAL, and petrol. in N. Y. State, Ashburner, inset maps (full) *Am Min* * v 16 -**88**, explorations along Niagara river and geol. of Buffalo, do. v 17 -**89**, explors. in eastern Ontario Peninsula, do. * v 18 -**90**, do. *E & Min* Mar 15-**90**; Mc Sweeney regen. puddling furnace for * Apr 20-**89**; measurement with Pitot tube gauge, S. W. Robinson * Feb 28-**91**; fields, Pitts., geol. of, Cummins, July 30-**92**; and oil, ed. *E News* Apr 14-**88**; Pitts., past and present, Mar 30-**89**; *E Rec* Dec 6 -**90**; industry, Pitts., Pa. *Sc Am Sup* * Jan 1; Philipp, June 9; Norton *Soc Arts Mass* -**88**

OIL-gas, compressed, Ayres, discuss., insets (full) *Inst C E* * v 93 -**88**; Pintsch system manuf. and applic. to railroad carriages, Hunter, inset * v 95 -**89**, do. plant *E News* * Apr 13-**89**; and oil, ed. Apr 14-**88**; manuf. at Holloway works, Great No. R., Ball, inset * v 110 -**92**; Young's plant *Sc Am Sup* * Dec 24-**92**

Gas PAVILION, Paris exhib. *Eng* July 26, 26-**89**
PHILADELPHIA City works *E News* Apr 14-**88**
PIPE, submerged, Grand Forks, So. Dak. *E News* * May 5-**92**
PRODUCER, Sheel's *Eng* * June 29-**88**; the Ingham *The Eng* * Jan 4-**89**
RETORTS, aut. *Sc Am Sup* * July 19-**90**; contin. feed and discharge, Haig * Jan 24-**91**
STOVES and burners, unburned gases in flue gases from, W. Thomson *Sc Am Sup* Dec 20, *The Eng* Oct 10-**90**
WATER-gas, as a steam boiler fuel, Jacobus *Am Min* v 17 -**89**; as used for metallurgical purposes, A. Wilson *Eng* June 8, do. *Sc Am Sup* * July 14-**88**, *Industries*; plant at Leeds Forge *Eng* * Jan 18; Thwaite, cor. Apr 5, 12, *The Eng* Apr 19-**89**; Langer, cor. *Eng* Jan 23, Head, cor. Feb 13-**91**; discuss. *E & Min* Feb 15-**90**

E News Reissig's proposed new kind, n Nov 14-**91**; value, Lunge, abs. *Inst C E* v 91 -**88**, *Oest Zeit Berg* v 35, *Chem Zeit* 51-**87**; poisonous action of, Schiller, abs. *Inst C E* v 95-**89**, *Zeit Hygeine* -**88**; theory of, Humphreys *Sc Am Sup* Mar 1-**90**

Gas-works, Phila. City *E News* Apr 14; small, regen. furnaces and setting, J. Smith, Robb *Sc Am Sup* Sep 29-**88**, *J Gas Lting*

Gaseous illuminants, Lewes (full) *Sc Am Sup* Mar 7-28-**91**, *J Soc Arts Lond.* See also FLAME; LIGHT

Gases, compressibility of oxygen, hydrogen, nitrogen and air, Amagat *F Inst* Sep -**89**; liquefied, new method of measuring heat of vaporization of, Mathias, Apr -**90**; liquefaction of *Locom* Nov -**91**, do., Cornish *Sc Am Sup* Oct 29-**92**

Gauges, wire and plate, ed. *E News* Dec 22-**92**. See also WEIGHTS and measures; WIRE gauges

Gearing, friction, paper covered, Suplee, n, a persistent form of tooth, Webb, friction in toothed, Lanza *Am M E* * v 9, 9 -**88**; worm-gearing of diametral pitch, Powel-Cheney * v 10 -**89**; new proc. for gen. and cutting teeth of spur-wheels, Swasey * v 12 -**91**, do. *Eng* * Jan 9-**91**, do. *E & Min* * Dec 6-**90**, do. *E News* * Nov 29-**90**, do. *Sc Am Sup* * Feb 14, do. *The Eng* * Jan 9-**91**

E News worm-gearing, expts. on effic. of, Flint * Apr 9-**92**; limiting numbers of teeth, Grant *F Inst* * Feb, MacCord, Apr -**88**; cusps of curve of teeth, do. * Sep -**89**; strength of teeth, notes, S. Webber, Sep -**90**

Gearing

Inst M E frictional, Dublin steam dredger, Griffith, insets * July -**88**, do. *The Eng* Aug 24-**88**; hypercycloidal, Vivarttas *R & Eng* * Apr, Aug -**88**; drawing, Forney * Oct – Dec -**91** * Jan -**92**; composite, MacCord *Sc Am Sup* * Apr 27-**89**; best form *The Eng* Nov 29, Dec 6-**89**; friction in toothed, Lanza *Tech Q* * Dec -**87**

Gems and precious stones of No. Am., Kunz, bk. review *Eng* July 25, do. *E & Min* May 3-**90**

Geneste, Frank A. B. *Inst C E* v 95- **89**

Geneva, util. power of river Rhone at. See POWER, Rhone river

Geography, Winton *Sc Am Sup* Dec 21-**89**; Stanley addr. (full) June 14-**90**

Geology, Vermilion lake, Brit. Am., region north of, notes on, Comstock *Am Min* v 16 -**88**; from a business point of view, Wins *E Mag* Dec -**91**; wind as a factor in, Merrill * Feb -**92**; Bulls. of U. S. Geolog. Survey, Wash. *E & Min* Mar 15-**90**; structural studies in, Willis * Oct 22-**92**; Geikie *Sc Am Sup* * Aug 11-25 * Sep 1, 8-**88**

Tech Q elevated pot-holes, Shelburne Falls, Mass., Crosby, Sep -**87**; and mineralogy instruction methods, Mass. Inst. Tech., do., joint structure of rocks, do., Feb; quartzites and siliceous concretions, do. May -**88**; Pinite, of Boston basin, relation to Felsite and conglomerate, do. Feb; Middlesex Cty. drift, Barton, May -**89**. See also COL; MINE, Haile, So. Car; NOVA Scotia; ORE deposits, No. Car., etc; PERU, etc.

Geometry, potential, Wolcott *El Wld* * July 21 * Aug 4-**88**, Aug 31-**89**; theorem and proofs *E News* * Jan 26, Mar 9-**89**

George, John R. *Inst C E* v 99 -**90**

George, Philip R., por. (full) *E & Min* * Nov 10-**88**

George, Robert J. *Inst C E* v 103 -**91**

Germany, industrial decadence in, Bayles *E Mag* Oct -**92**; the German army, A. Clark *Sc Am Sup* * Nov 16-**89**

Geysers, soaping, Raymond, Hague *Am Min* v 17 -**89**, *E & Min* June 8, *Sc Am Sup* June 1-**89**

Gibraltar, defence *Sc Am Sup* * Aug 17, 17-**89**

Gilbert, William, of Colchester *Eng* Dec 20, 27-**89**, (full) *Sc Am Sup* Mar 29-**90** *Eng*

Gillham, Francis *Inst C E* v 110 -**92**

Gilsonite, spec. from Uintah Cty., Utah, Raymond *Am Min* v 17 -**89**

Girder, continuous, Lindenberger *F Inst* * Jan, Mar -**91.** See also BEAMS and girders

Gisborne, Frederick N. *El Wld* Sep 20-**92**

Glacial, epochs, D'Assier *Sc Am Sup* Feb 4, 11-**88**; geology, Geikie, Nov 30, Dec 7-**89**

Glass, the Jena optical *Eng* * Apr 24, May 1-**91**; transverse strength, Connert, abs. *Inst C E* v 93 -**88**; *Civilingr* -**88**; making, Henderson *F Inst*, *Sc Am Sup* Feb 4, 11; manuf. * July 28-**88**; Venetian, Salviati, Aug 31-**89**; chem. of, Gehring, Feb 15, 22; influence of cooling proc. on optical properties * Mar 15-**90**; substitute for, Eckstein * Sep 19-**91**; glass-ware manuf. * Nov 19-**92**

Glazing, or lustering bodies *Sc Am Sup* Apr 9-**92**

Globe, terrestrial, Paris exhib. *Sc Am Sup* * June 22 * Aug 10-**89,** *Genie Civil*, *La Nature*

Gold, *Am Min* chlorination of gold-bearing sulphides, Spilsbury, v 16 -**88**; chlor. of low-grade auriferous sulphides, Phillips, v 17 -**89**; treatment of fine gold in sands of Snake river, Idaho, Egleston * v 18 -**90,** Thies proc. of treating low-grade aurif. sulphides, amalgamation at Comstock lode, Nev., hist. sketch, Hodges (full) * v 19, 19 -**91**; electro-magnetic separation of *El Rev* * Sep 28; in Nova Scotia, n *Eng* Jan 4-**89**

E & Min and silver produc., '87, Jan 21, do. precious metal produc. in U. S. July 21; Mich. finds, Parker * Sep 22-**88**; U. S. produc. '88, Mar 2, June 15; extraction by lixiviation, W. Wilson, Apr 13-27; produc., Dorsey, Oct 5; deposits, Ouray, Col., origin, Endlich, 19-**89**

E & Min world's produc. Jan 4, Valentine's stats. 18; washing and dredging, N. Zeal. Nov 1; auriferous gravels of Cal., Hammond, Sep 13; chlor., plea for Plattner proc., Butters, cor. Dec 20; precipitating in chlor., new method, Godshall, Nov 29 -**90,** Rothwell, Feb 7; world's produc. Jan 3, Valentine stats. 24, Feb 28, 28; amalg. at Comstock lode, Nev., Hodges * Feb 14, 21; chlor. of gold-ores, Burfeind, Apr 11; precious metals produc., U. S., '89, May 3, future of, ed. 31; and silver parting, Moebur's electrolytic proc. at Pinos Altos, Maynard * May 9-**91**; and silver produc. '91, Jan 2, world's produc., ed. Mar 5; cyanide proc. in So. Africa, Butters * Oct 8, 15, chem. of, 22, 29-**92**

Inst C E chlor. of gold-bearing sulphides, Spilsbury, abs. v 91 -**88**; and platinum indus. of the Ural, Laurent, abs. v 105 -**91**; *An Mines* v 18-**90**; gold-quartz reduction, Curtis, dis-

Gold

cuss., inset (very full) *Inst C E* * v 108 -**92**; and silver produc. in U. S., '88 *Locom* June -**89**

Sc Am Sup es. of minute quantities of, Tate (full) May 24-**90**; in Columbia (Brit.) Prindle, May 16; Thies proc. of treating low-grade aurif. sulphides, Aug 22-**91**; cyanide proc. for, Apr 16, do. without amalgam., gold and silver ore working, MacArthur-Forrest proc. (full) Aug 6; cohesive property, Guilford, Nov 5; gold-saving machine * 12-**92**; ores amalgam. system, Richards *Tech Q* Feb -**90**

FIELDS, Dekaap, in the Transvaal, notes on geol. of, Furlonge, inset *Am Min* * v 18 -**90**; the Bendigo gold-field, Rickard (very full), n p 772 * v 20 -**92**; Queensland, *Eng* Jan 22, Feb 19, 26, Mar 4-**92**; of So. Africa, Halle *E Mag* * Feb insets * July; Ecuador, Lord, May; of Bendigo, Austral., Markes, insets * Dec -**92**; So. Africa *E & Min* Jan 5; Transvaal, do. May 4; the Southern (U. S.), Hand, 18-**89**; Dekaap, Transvaal, note on geol. of, Furlonge * Mar 8-**90**. See also GOLD mines, Victoria

MILLING, in Black Hills, Hofman, inset (full) *Am Min* * v 17-**89**; and mining in Korea, Pierce, n * v 18 -**90**; Chinese system, Louis * v 20 -**92**, do. *E & Min* * Dec 5-**91**; notes, Aaron (full) Aug 10, 17-**89**; ores milling variations, Rickard, Aug 27, Sep 3, 10, Dec 3, 10-**92**

MINES and mining, and silver miners, modern, Wins *E Mag* * Oct -**91**; hydr. mining in Nev. *E & Min* * June 16-**88**; and silver mining profits, ed. Jan 30-**92**

BLACK Hills, in, Hanson *E Mag* * Aug -**92**

CALEDONIAN Co. report *E & Min* June 22-**89**

CARLISLE and mill, New Mex. *E & Min* June 2-**88**

CERRO de Pasco mining plant stamp mill, Transvaal *The Eng* * Feb 15-**89**

CHINESE mining system, Smithers' report *E & Min* Sep 8-**88**; Dec 31-**92**

HAILE mine, Lancaster Cty., So. Car., Thies proc. at *Am Min* * v 19 -**91**

MORGAN mine in Wales *Eng* June 22-**88**

MT. Morgan mine, Queensland, Rickard, *Am Min* * v 20 -**92**, *E & Min* * Aug 22, 29-**91**

MULATOS mines, State of Sonora, Mex., Janin *E & Min* * Feb 1-**90**

Gold MINES, PERU, mining in, by the Incas, Olcott *E Mag* * **Apr -91**
TRANSYLVANIA, mining in, Thito, abs. *Inst C E* v 99 -**90**, *Berg u Hut Zeit* -**89**
UTAH and Mont., and silver mining in, Hollister *Am Min* v 16-**88**
VICTORIA mining, '91, commission report, abs. *Inst C E* v 110 -**92**
ORES, roasting, losses in and volatility of, Christy *Am Min* v 17 -**89**; assoc. with other metals in the west, Pearce, Pres. addr., gold-quartz, Courtis, insets, deposits, Montgom. Cty., Md., notes on, Emmons * v 18, 18-**90**; roasting losses, Christy (full) *E & Min* Sep 8, 15, 29-**88**; notes on treatment of, O'Driscoll, bk. review, Sep 28-**89**; chlorination, Burfeind, Apr 11-**91**; milling variations, Rickard, Aug 27, Sep 3, 10, Dec 3, 10-**92**; MacArthur-Forrest proc. for treatment of refractory, W. Jones *E & Min*, do. *Sc Am Sup* Mar 8-**90**, cyanide proc. of working without amalgam., do. (full) Aug 6-**92**; amalgam. system, Richards *Tech Q* Feb -**90**
SMELTING, and silver ores. in E. Hungary and Transylvania, Schnabel, abs. *Inst C E* v 95 -**89**, *Zeit Berg Hut* -**88**, at Arga, Col., Pearce, abs. *Inst C E* v 98 -**89**, *Am Min* June -**89**
Gold Coast banket deposits, W. Africa, Halse *E & Min* Mar 14-**91**
Gooch, Daniel *The Eng* Oct 18-**89**
Goodyear, Charles (rubber inv.), por. *Sc Am Sup* * Jan 31-**91**
Gordon, Joseph *Inst C E* v 100 -**90**
Gould, Jay *El Wld* Dec 10, ed. *R Gaz* Dec 2-**92**
Government engineering, worthless, Wisner *E Mag* Jan, Mar, defended, King, Feb, plan of reform, Wisner, Apr -**92**
Gowen, Franklin B., Coxe *Am Min* v 18 -**90**, por. *E & Min* * Dec 21-**89**
Governors, shaft, analysis of, Rites *Am Min* * v 13-**92**, *Iron Age* Dec 8-**92**. See also ENGINES, governors
Grading and ditching, simple methods of, Rogers *E News* * Nov 8-**90**
Graff, Frederick *F Inst* June -**90**
Grain, storage warehouse and machinery, Alexandra dock, Liverpool, Shapton *Eng* Aug 7 * Sep 11, insets *Inst M E* * July -**91**; transport. in Russia, ed. *R Gaz* Apr 29, May 6-**92**; Ritchie's steam whizzer *Sc Am Sup* * May 24-**88**, *The Eng*

Gramme, Zenobe, por. *Sc Am Sup* * May 25-**89**
Grammophone, the Berliner *El Rev* * Dec 27-**90,** Jan 3-**91**; Houston *F Inst* * Jan; etching the human voice, Berliner * June, do. *Sc Am Sup* * July 14-**88**; * Sep 6-**90**
Granite indus. of U. S., Day *E & Min* Apr 25; quarrying, cutting and polishing, do. May 9; rifting, Tarr * 23-**91,** *Am J Sci;* indus., U. S. *E News* May 2; quarrying, Cen. bull. *E Rec* Apr 18-**91**
Grant, John *Inst C E* v 92-**88**
Grantham, Richard B. *Inst C E* v 108 -**92**
Graphical dynamics, the subnormal in, Church *F Inst* * Jan -**92**
Graphics, or the Art of Cal. by Drawing Lines, R. H. Smith, bk., Longmans, Lond., '89 *The Eng* Sep 6-**89**
Graphite produc., U. S., '89, Parker, Cen. bull. *E & Min* Oct 10 -**91**
Graphophone, Edmunds *Eng* Sep 28; and phonograph (full) *Sc Am Sup* * Oct 27-**88.** See also under PHONOGRAPH
Grates. See FURNACES, grates
Gravel mining, Osceola Co. report *E & Min* * May 30-**91**
Gravitation, theory verification, Gore *R & Eng* * June -**91,** mystery of, do. *Littell's* Mar 12-**92,** *Nat Review;* constant measuring, Cavendish expt., Boys (full) *Sc Am Sup* * Mar 22-**90**
Grease, Yorkshire, Hurst *Sc Am Sup* May 25-**89**
Great Britain, trade, export and import, diag. *Eng* * Mar 16; port and harbor defence, ed. Dec 28-**88,** cost of national defence, Dilke, Jan 9, imperial, ed. Mar 13; ordnance factories constitution, Anderson, Oct 9-**91**; currency commissioners' arguments *E & Min* Nov 24; coast defences of the United Kingdom *The Eng* May 25-**88**; ten years' foreign trade, July 4-**90.** See also BRITISH; ENGLAND; NAVIES, Great Britain
COLONIAL development and Brit. trade, ten years of *Eng* Mar 20-**91,** *The Eng* Jan 24-**90**; Brit. colonies as fields for the C. E., Coode, Pres. addr. *Inst C E* v 99 -**90**
NAVY, naval manœuvres, ed. *Eng* Jan 6; estimates, eds. Mar 9, Dec 21-**88,** Mar 29; strength of, ed. Feb 15; coaling, Longridge, July 19; contract work, ed. Oct. 18; ed. Nov 29; naval mobilization, bk. review, Dec 27-**89**; estimates, ed. Mar 14; naval manœuvres, White, 28; additions in '90, Dec 19-**90**; estimates, ed. Feb 27, Mar 6; additions in '91, Dec 18-**91**; condition *The Eng* Aug 1-**90**; estimates, Mar 11; artificers, June 17-**92.** See also NAVIES, Great Britain

Great BRITAIN, SHIP-building, 1889 *Eng* Dec 20, 27-**89**; **shipping** stats. May 30; and marine eng. in '89, Jan 3, 17, 24, in '90, **Dec** 26-**90**, Jan 2, Scotland * 23; supremacy of mercantile **fleet**, eds. July 10, Oct 30-**91**; 1891, Jan 1-22-**92**. See also SHIP-building

Greck, Peter *Inst C E* v 94 -**88**

Greece and Egypt, ed. notes *E News* Aug 23, 30-**90**

Greeley, Horace, fac-simile letter *El Rev* * Oct 18-**90**

Greenland, Peary expedition, Heilprin *E Mag* * Mar, *E News* * Sep 15-**92**

Grice, Edward *Inst C E* v 96 -**89**

Grierson, James (full) *Inst C E* v 99 -**90**

Griffin, Heneage M., por. *E & Min* * May 30-**91**

Grinding machine, universal, Brown & Sharpe Manuf. Co. *E News* * Mar 7, *R Gas* * Feb 27; machinery, Ball mill plant *The Eng* * Mar 13-**91**. See also DISINTEGRATORS; EMERY wheels; MILLS

Grist mills *Eng* * June 27, and disintegrator trials, Roy. Agric. Soc. *The Eng* * June 27-**90**

Grundtvig, Conrad H. W. *Inst C E* v 103 -**91**

Gruson, Hermann, por. *Sc Am Sup* * Aug 10-**89**

Gum arabic and mod. substitutes, Rideal (full) *Sc Am Sup* Sep 19, 26-**91**, *J Chem Indus*

Gunnery and armor *Cassier's* elec. welded projectiles, Maxim * Oct -**92**; *Eng* Lydd artillery expts. Jan 4; tests of the Piemonte, ed. Sep 27-**89**; ar. plate trials in Am. * Oct 24-**90**, vel. of projectiles, Holden, Oct 23; compound ar. trials * Nov 6, 13; French nickel steel ar. trials * Dec 25-**91**

E News cellulose ar. Dec 1-**88**; steel, Annapolis tests, Sep 20, 27 * Oct 4-**90**; Justin projectile expts. * Aug 4-**92**; Gov't. ar. tests, Indian Head, Md. * Nov 28, do., ed. *Eng* Nov 27, do. *The Eng* Nov 20, Dec 11-**91**; development of Am. ar. plate, Garrison, insets (full) *F Inst* * May – July -**92**; ar. plate perforation expts., Labouret, abs. *Inst C E* v 102 -**90**; forged steel projectiles, manuf., Carnegie, abs. v 110 -**92**; ar. development, Califf (full) *R & Eng* * Nov -**89** — Nov -**90**, expts. * July, Aug -**91**, Am. trial, do. * Jan -**92**; Annapolis test *R Gas* Sep 26-**90**

Sc Am Sup dynamite shells fired from ordinary guns, expts. * Mar 10; Krupp's projectiles and ar. expts. at Meppen * Sep 8-**88**; ar. expts. * Aug 31 * Sep 7, 14-**89**; Annapolis ar. trial

Gunnery

* Oct 18; armament, new features (high angle fire) * Nov 22-**90**; mod. ar., Brainard * May 23-**91**

The Eng penetration of ar. plates, cal. of trajectories, May 11, 11; Krupp's projectiles and Brit. steel-faced plates, July 13; French and Ital. ar. tests, Nov 16; Gruson's armored carriages, Schumann, Dec 7, 7; ar. lead tempering, Lisbonne, June 1-**88**, *Genie Civil*

The Eng, the Graydon shell * Feb 22; ar. for ships, Barnaby * Apr 12; compound ar. and steel, Schneider, July 12, 12; Dutch ar. trials * Nov 22-**89**; artillery expts. at Buckau * Sep 26 * Oct 3; steel-faced ar., St. Petersburg trial * Nov 21-**90**

The Eng Russian ar. trials * Jan 9; deck ar., for vertical fire, expts., Japan * June 5; Bethlehem steel ar., after test * Aug 28; Royal ordnance factories, constitution of, Great Brit. Oct 9; ar. trials at Shoeburyness * Nov 6, at Portsmouth, England * Nov 13-**91**

The Eng Harvey nickel ar. trial * Aug 19; ar., recent prog. * Sep 16; Vickers Harvey ar. * Dec 16; German and French imitation cupolas and shields * 23-**92**; gunnery questions, how settled by cal. July 27, Sep 28, Dec 21-**88**, Jan 11, Aug 16, 23-**89**, Feb 14 * Mar 14-**90**

RANGE finder, Fiske's elec. *E News* * Jan 31-**91**, position indicator *El Wld*, *Sc Am Sup* * Apr 19-**90** * Feb 7-**91**, *El Eng*, *The Eng* * Dec 26; underground range, Kennington * Apr 18-**90**. See also INSTRUMENTS, range finder; PROJECTILES

Guns, development of aut. fire-arms *Eng* Jan 27, Feb 3; steel for heavy, ed. Mar 23, May 25, Cubillo * 25, cast steel, ed. Dec. 21-**88**; cor. Mar 1; and gun-powder, Longridge, Oct 25-**89**; aluminum-bronze for, Dogger, Sep 12-**90**; development of field artillery, Walford, Mar 6-**91**; U. S. mod. artillery * Oct 21, 28 * Nov 4-**92**

E News making of great guns, ed. Nov 16-**89**; new cannon for U. S., n Jan 31-**91**; Paris exhib., metallurgical arts, Garrison *F Inst* * July * Aug -**90**; use of liners in ordnance, Longridge *Inst C E* v 109 -**92**; steel, Chernoff, inset *Inst M E* * July -**91**; 111-ton English *R & Eng* * Mar -**88**; 110-ton * Sep -**91**, do., firing of *Sc Am Sup* * July 18-**91**; the gun * Oct 5, 12-**89**, *Genie Civil;* Brit. and foreign *The Eng* June 1; of the Benbow, Jan 13; the supply of 1886-7, June 8; siege artillery, English and Russian, Nov 30-**88**; Internal Ballis-

Guns

tics, Longridge, bk., Spon, Lond. '89, Sep 13–**89**; at Naval exhib., Lond. * May 29; erosion in large, Maxim * Sep 11–**91**

ARMSTONG rapid fire *R & Eng* * July –**91**, *Industries*; 110½-ton, for str. Victoria *The Eng* * Mar 28, str. Teutonic * Dec 19–**90**

BREECH-loading, mechanism for 10-in. *Eng* * June 10–**92**; 12-in army rifled *R & Eng* * Sep –**91**, *Iron Age*

BOFORS cast steel, Michaelis *Am Min* v 16 –**88**, *Sc Am Sup* Sep 15–**88**

BROWN segmental wire-wound *E News* * Nov 24–**92**, *Sc Am Sup* *Jan 11–**90**, Wittman *Dec 24, *The Eng* * Nov 11–**92**, *Am Min*

CANET quick firing, with elec. training gear *El Rev* * Sep 27–**90**; 66-ton, test *Eng* Feb 27, Sep 4; vs. Krupp, Dec 25–**91**, Jan 1, 15–29, Feb 5, Apr 1, May 20, June 3, 10–**92**; large, for Japan *E News* * Jan 30; and ar. trials *Sc Am Sup* * Jan 16, 16–**92**; *The Eng* * June 12 * Dec 11–**91**

CANNON, mod. high power rifled, development, Califf (full) *R & Eng* * Jan * Feb, Apr — * Oct –**89**

COLT'S navy revolver, com. report *F Inst* * May –**90**

DRIGGS-Schroeder quick firing *Eng* * Oct 28–**92**

DYNAMITE, development, Batcheller *E Mag* * Sep –**91**; 15-in., trial *Sci Am* Feb 16–**89**; Zalinski pneu. *Sc Am Sup* * May 12; pneu., Haig * Mar 10, do. *The Eng* Feb 3, Zalinski, 17–**88**; U. S. navy report, Mar 29–**89**; the Graydon * Jan 30–**91**; pneu. sea-coast (full) * June 10, 10–**92**

ELSWICK *Eng* * Oct 25 * Nov 1, 15–29–**89**, Naval exhib. * July 17, gallery, do. *The Eng* * May 1–**91**; 6-in. disappearing carriage * Mar 11–**92**

FACTORIES, of Forges and Chantiers, Havre (full) *Sc Am Sup* * June 21–**90**; Royal ordnance, constitution of, Great Britain, Anderson *The Eng* Oct 9–**91**

FIELD, and mountain, Armstrong *Eng* * Dec 6–**89**; Russian field and coast *Sc Am Sup* * Sep 1–**88**, *The Eng*

FRENCH artillery, insets (full) *Eng* * Jan 3–**90** — Apr 24–**91**; quick firing, ed. Aug 12–**92**; mod. *Sc Am Sup* * July 19–**90**

GERMAN magazine rifle *Eng* * May 15, new *Sc Am Sup* * Jan 3–**91**

GIFFORD liquid-gas *E News* * Aug 9, carb. acid *Sc Am Sup* * Aug 30–**90**

GRUSON'S quick fire *R & Eng* * Apr, *The Eng* * Jan 10–**90**

Guns, HOTCHKISS ordnance *Sc Am Sup* * July 13-**89,** revolving cannon * Mar 7-**91,** *Eng;* Paris exhib. *The Eng* * June 7-**89**
HOWITZER, 11-in., Armstrong *Eng* * Jan 6-**88**; cast iron, Spain * Mar 11-**92**; high angle battery *The Eng* * July 18-**90**
KRAG-Jorgensen repeating rifle *E News* * Oct 6, *R & Eng* * Oct -**92**
LEBEL magazine rifle *Sci Am* Oct 27, *The Eng* Sep 28, 28-**88**
LONGRIDGE, the *Eng* * May 4, 11, *The Eng* May 11-**88**
MACHINE, Miller's aut. indicator for *Sci Am* Mar 9-**89**
MAGAZINE rifles, rifle-mark, ed. *Eng* * Feb 6; the Mannlicher (our new) * Mar 6; the Mauser * Apr 3; Swiss * Oct 2; Rees' * Nov 27-**91**; new *Sc Am Sup* Apr 5-**90**; mag. guns development, A. Russell * *Soc Arts Mass* -**90**; *The Eng* * Apr 4-**90**; new * Feb 6; small arms, tests, N. Y. * Sep 4-**91**
MAXIM aut. machine, inset *Eng* * Jan 27; 3-pounder * June 22-**88**; * Oct 9, 16-**91**; *Sci Am* Feb 16-**89**; *Sc Am Sup* * July 7, *The Eng* June 1-**88**
MORTARS, U. S. cast iron coast *Eng* * Mar 18, 25 * Apr 1-22, do. 12-in. breach-loading rifled *E News* * Dec 8, *R & Eng* * Dec -**92**; 12-in. manuf., Fuller, Connet *Sc Am Sup* * Sep 6-**90** * Jan 17-**91,** *Steven's Indic;* 12-in. rifled, S. Mansfield *Soc Arts Mass* -**91**; mod. breech-loading rifled construct., A. Russell *Tech Q* * Apr -**92**; Whitworth mounting for high angle fire *The Eng* * July 24-**91**; U. S. breech-loading * Dec 9-**92**
MOUNTINGS, strs. Devastation and Rupert *The Eng* * Apr 24 -**91**
NORDENFELT, disappearing turrets for *Eng* * Oct 30-**91**; light quick fire batteries *The Eng* Jan 20, Feb 24-**88**
PNEU., torpedo, Zalinski *Eng* July 12-**89,** do. *R & Eng* * May -**88**; *Sc Am Sup* * Oct 12; the Dudley *The Eng* Sep 6-**89**
QUICK firing, rapid firing, Kimball *Eng* Jan 13, Feb 10, 24, Aug Aug 24-**88**; ed. Sep 30, Oct 7-**92.** See also GUNS, Drigg's—Gruson — Nordenfelt — Schneider, etc.
RIFLES of mod. armies *R & Eng* Jan -**88**; military rifle development, Califf * Jan * Feb -**89,** do., reduction of calibre in, Dunn *Sc Am Sup* Dec 22-**88**
RUSSIAN artillery in 1888 *The Eng* July 27-**88**
SANSPAREIL, the *The Eng* * Feb 6-**91**
SCHNEIDER quick-firing *Eng* * Sep 16-**92**
SMALL arms manuf., Rigby *Eng* Dec 2, *Inst C E, The Eng* Dec 2-**92**; magazine, tests, N. Y. * Sep 4-**91**

Guns, STEADY platform, Tower's *Eng* * Apr 26-**89**
TESTING at Sandy Hook, Perrine *E Mag* * June -**92**
THURLOW cast-steel *E News* Feb 16-**89**
U. S. mod. artillery *Eng* * Apr 29 – Sep 23, table (full) 30 * Oct 7, 21, 28 * Nov 4-**92**; new cannon for, n *E News* Jan 31; ordnance, notes, table *R & Eng* Aug -**91**, *Ar & Navy J.* See also GUNS, mortars, U. S.
Gutta-percha *El Rev Lond* Nov 21, Dec 5-26-**90**, Jan 2, expts. Mar 6, supply, n Oct 23-**91**, do., Serullas, May 20-**92**, future supply, do. *Sc Am Sup* Nov 5-**92**
Gymnastics, exercises and ap. *Sc Am Sup* * Mar 16-30 * Apr 6 -**89**; * June 7-**90**
Gyroscopes, Jansen, cor. *The Eng* * Sep 30-**92**

Hack, Thomas *Inst C E* v 93 -**88**
Hackney, William *Inst C E* v 100 -**90**
Haghe, Augustus *Inst C E* v 101 -**90**
Hall, Richard T. *Inst C E* v 99 -**90**
Hall, William J. *Inst C E* v 102 -**90**
Hallauer, Octave-René, Hirn *The Eng* June 13-**90**
Hamand, Arthur S. *Inst C E* v 97 -**89**
Hamill, Edward D. *Inst C E* v 109 -**92**
Hamilton, George A., por. *El Wld* * May 11-**89**
Hammers, Thwaite's suspen. pneu. power *Eng* * Mar 13-**91**; aut., the MacCoy pneu. tool *E News* * July 27-**89**; and rams, Jameson *R & Eng* Oct -**89**; the Longworth power * Aug -**92**, *The Eng;* pneu. *Sc Am Sup* * Apr 25-**91**; blows, force of, *The Eng* Aug 30-**89**. See also STEAM hammers
Hampton Roads *R & Eng* Oct -**90**
Hancox, Joseph *Inst C E* v 99 -**90**
Hand-writing, elec. transmitting, Gump * *Soc Arts Mass* -**89**
Hanna, Francis B. *Inst C E* v 102 -**92**
Hanscom, William W. *Am M E* -**88**
Harbor engineering *Eng* harbors, natural and artificial, Cheesewright, Mar 20; concrete in har. works, Apr 17-**91** * Aug 26 * Oct 7-**92**
E News physical phenom. of entrances, Haupt * Feb 25-**88**; excav. under water, cost, table, U. S. Eng'r. Dept., Jan 5; submarine excav. in sand, Ter-Meulen excavator * Mar 23-**89**; double sextant for hydrographic surveys * June 28; subaqueous foundations, Kinipple * Dec 13, 27-**90**; shore protection * Feb 6-**92**

Harbor engineering

E Rec subaqueous foundations, grouting below water, Kinipple, Feb 21; coffer dam or caisson without timber or iron, Harris, Mar 7; natural and artif., Cheesewright (full) * Apr 18-**91**, do. *Sc Am Sup* * May 30 * June 6-**91**; use of beton in construct. of ports, Kinipple * Nov 24-**88**; Am. eng., Wisner, Aug 15; Lobnitz system of rock removal under water without explosives *Oct 3-**91**; submarine excavs. in sand *May 18-**89**, *Genie Civil.* See also CANALS; DAMS; DOCKS; DREDGING; FIRE Is; FLOOD gates; FOUNDATIONS; LANDING stage; LIGHTHOUSES; MARINE signals, types; PIERS; PILES; RESERVOIRS; RIVERS imp., etc.

ANTWERP port works, Matthys abs. *Inst C E* v 101 -**90**

ARDROSSAN works *Eng* Nov 1-**89**

BARS, in tidal estuaries, Wheeler *Eng* Feb 7-**90**; imps., Haupt *F Inst* July, D'Auria, Sep, discuss., Haupt, Oct -**89**

BAYONNE port *Eng* * Dec 6-**89**

BEACON lights and fog signals, Douglass *The Eng* * Mar 29-**89**

BILBAO *E News* * Aug 31-**89**

BORDEAUX port *Eng* * Dec 13-**89**

BRAZOS river imp. and, Craighill, Corthell, discuss. *Am C E* v 26 -**92**

BREAKWATERS, concrete, Del. bay *E News* * Jan 31; do., Schermerhorn report (full) *E Rec* * May 16-**91**; and force of impact of waves, d'Auria *F Inst* Nov -**90**, Jan -**91**

BREMEN works, abs. *Inst C E* v 96 -**89**, *Zeit deut Ing* -**89**

BUOYS, elec. lighted, N. Y. *El Wld* * Feb 2-**89**; and beacons, the Pintsch compressed gas system *E News* * Jan 17-**91**; buoying and lighting tidal rivers, Wheeler *The Eng* * Apr 8, 29-**92**

CALAIS works, France *Eng* * May 17, inset, 24, 31-**89**; quay foundations, Betillart report *E News* * Jan 4-**90**; Richou, abs. *Inst C E* v 101 -**90** * *Genie Civil* v 15-**89**; inset *Inst M E* * July -**89**

CAPE Hatteras, Walters *E Mag* * July -**92**

CHARLESTON imp., Wisner *R Gas* Sep 30-**90**

CHICAGO as a sea-port, maps *Eng* * Feb 20, do. *Sc Am Sup* * Mar 28-**91**; ed. *R Gas* July 15-**92**

CORK port, deep-water quays, Barry, inset *Inst C E* * v 100 -**90**

CORPUS Christi, Tex., deep-water project, Kent *E & Min* * Aug 23-**90**

Harbor, DEFENCE, elec., Sims-Edison torpedo *El Wld* * Apr 25 -**91**
DELAWARE breakwater imp. *E News* * Feb 6-**92**
DIEPPE, Alexandre, abs. *Inst C E* v 93 -**88** * *An Ponts* v 14 -**87**
DOCKS, N. Y. bulk-head construct. *E News* * May 25-**89**; Royal Albert, blowing up of basin wall at, Thomas * Sep 20-**90.** See also DOCKS; HAR., Hull — Limerick, etc.
DUBLIN port, Griffith, insets *Inst M E* * July -**88**
DYKES, brush, spec. for, Craighill *E News*, Oct 19-**89.** See also DIKES; HOLLAND, do; RESERVOIRS; RIVERS, imp.
ENGLISH, new schemes *Eng* Jan 23-**91**; Brit., and water-ways *The Eng* Aug 5-**92.** See also HAR., Goole
GALVESTON, Tex., entrance imp., Wisner, cor. *E News* Dec 6-**90**; prob., Haupt *F Inst* Oct -**91**
GOOLE port imp., E. coast, England *The Eng* * Dec 20-**89**
GREAT Yarmouth, Ayers, cor. *Eng* * Dec 13-**89**
HAMBURG, Alster lock widening, Roeper *Inst C E* v 107 -**92** * *Deut Baus* -**91**
HAVRE port *Eng* Oct 25, Nov 8 * 29-**89**; imp. of sea-ports of Seine, LeBrun, abs. *Inst C E* v 93 -**88,** Rochemont *Mem Soc Ing Civils* * Mar -**88**; imp. n * *Sc Am Sup* Apr 13-**89**
HELL-gate, N. Y. See HAR., N. Y.
HULL, Alexandra docks, Hurtzig *The Eng* Mar 2-**88**
INDIA, West of, Portuguese R., Sawyer, insets *Inst C E* * v 97 -**89**
ITALY ports of, Gatto, abs. *Inst C E* v 104 -**91,** *Il Polit* -**90.** See also HAR., La Rochelle — Naples
JETTIES as applied to har. entrances, U. S., Haupt *Inst C E* v 99 -**90.** See also RIVERS, jetties
LAKE Ontario natural harbors *E News* * Mar 8-**90**
LA ROCHELLE works, Italy, com. report, abs. *Inst C E* v 95-**89,** *Giorn Genio Civil* June -**88**
LIMERICK dock walls, failure and construct., Hall *E Rec* * Mar 28-**91,** *Inst C E*
LYNN Haven Bay as a har. of refuge Barroll *R & Eng* * Dec -**91**
MALINO, Sweden *E News* * May 26-**92**
MARIANOPOL works, Hermann, abs. *Inst C E* v 103 -**91** *An Ponts* Aug -**90**
MEMPHIS imps. *E News* * Nov 2-**89**

Harbor, MONTREAL imps. *E News* * May 2-**91** ; old revetment wall, Sproule *R & Eng* * Dec, *R Gaz* * Nov 18-**92**
NANTES port of *Eng* * July 19, 26-**89**
NAPLES works, Gatto, abs. *Inst C E* v 102 -**90**, *L'Ingeg Civile* -**90**
NEW York, bulk-head construct. *E News* * May 25-**89** ; imp. of entrance, Edwards, dredging ap., inset * Mar 19 ; masonry sea-wall, light-house station * Dec 15-**92** ; removal of obstructions, Hell-gate, abs. *Inst C E* v 93 -**88**, * Report Ch. of Eng'rs. U. S. Army -**86** ; imp. *Sc Am Sup* * Aug 25-**88**
OTAGO imp. Barr *Inst C E* v 110 -**92**
PIERS. See PIERS ; WHARFS
PHILADELPHIA port of, Haupt *F Inst* Jan, Mahan, Mar, Apr -**92**
POINT Judith harbor of refuge, R. I. *E News* * Apr 18-**91**
POOLE improvement *The Eng* May 8-**91**
PORTSMOUTH, tides near, Townshend, inset, abs. *Inst C E* * v 97 -**89** ; dockyard, C. Robinson *Sc Am Sup* * Dec 3-**92**
PRESTON docks *The Eng* Mar 23-**88**
RICHMOND, Va., eng. prob. at, Adams *Am M E* * v 12-**91**
ROCHELLE, compressed air pier foundations, Thurninger, La Pallice har., abs. *Inst C E* v 100 -**90**, *An Ponts* * Nov -**89**
ROUEN port of *Eng* * Oct 11-**89**
SABINE Pass imp., Turtle, cor. *F Inst* Sep -**88**
ST. John, N. B., imp. and docks *E News* Apr 7-**88**
ST. Nazaire, France, lowering masonry shafts for quays, Mahan *E News* * Oct 27-**88**
SALTBURN-by-Sea, works near *Eng* * Mar 14-**90**
SAN Francisco, water-front structures, Manson *E News* * Dec 29-**88** ; caisson used in founding sea-wall, R. Hunt * Aug 2-**90**
SCOTLAND, N. and West coast piers and, Barron, inset *Inst C E* * v 99 -**90**
SEA-walls, use of asphaltum in, Ambrose, and discuss. *Am C E* v 24 -**91**, do. *E Rec* May 16-**91** ; caisson used in founding, San Francisco, R. Hunt *E News* * Aug 2-**90** ; masonry, light-house station, N. Y. * Dec 15-**92** ; sinking foundation of by water-jet *E Rec* * Mar 14-**91** ; Scarborough, No. Cliff, and Royal Albert drive securing, Aytoun, insets *Inst C E* * v 105 -**91**
SWANSEA port and dredging entrance channel, Capper *Inst C E* v 103 -**91**

Harbor, TEXAS deep-water port, need of the So. West, Haupt *R Gaz* Aug 10, *Sc Am Sup* Oct 6-**88**
TORONTO esplanade question *E News* * Jan 4, 11-**90**
U. S. river and har. appropriations *E News* Mar 8-**90**; Southern states tide-water terminals, Haupt *R Gaz* Mar 15, Apr 12 -**89**
VERA Cruz port, *E Rec* Dec 6-**90**, Corthell cor. Feb 21-**91**
WILHELMSHAVEN, second entrance construct., Rechtern, abs. *Inst C E* v 107 -**92** * *Zeit Arch Ing* Hanover -**91**
WIVENHOE, dry dock at *The Eng* Aug 17-**88**
YOKOHAMA *Eng* * Dec 12-**90**, cor. May 22-**91**
Hardcastle, Bey, William J. *Inst C E* v 107 -**92**
Harker, Harold H. *Inst C E* v 109 -**92**
Harp, the clavi-harp *The Eng* Apr 27-**88**
Harper, Edmund L. *Inst C E* v 105 -**91**
Harpur, Samuel *Inst C E* v 95 -**89**
Harris, Robert *Inst C E* v 110 -**92**
Harrison, John T. *Inst C E* v 109 -**92**
Harrison, Thomas E. *Eng* Mar 23, por. * Apr 13, *The Eng* Mar 23, por. (full) *Inst C E* * v 94-**88**
Hat-making processes *Sc Am Sup* * Sup 626, Jan 14, 21-**88** (628) *Industries*
Hawaii, business opportunities, Hau *E Mag* * June -**91**
Hawkes, Edward C. *Inst C E* v 101 -**90**
Hawkins, Edward J. *Inst C E* v 109 -**92**
Hawkins, George *Inst C E* v 95 -**89**
Hawkshaw, John *Eng* June 5, *The Eng* June 5, por. (full) *Inst C E* * v 106 -**91**
Hay fever, Stockwell (full) *Sc Am Sup* Aug 31-**89**
Hay-press, and straw, Roy. Agric. Soc. trials *The Eng* July 6-20 -**88**
Hayti, Ravine du Sud, averting overflow, Crowell, insets *Am C E* * v 24 -**91**
Hayward, William *Inst C E* v 103 -**91**
Heal, Chesley, the centenarian *Locom* Mar, *Sci Am*, por. (108 years old) *Sc Am Sup* * Mar 16-**89**
Health, congress, Lond., pro. *Eng* Aug 14-28-**91**; and physical exercise, Taylor *F Inst* Sep, Oct -**92**; prevention of consumption, Prudden *Locom* Aug -**89**; disinfection *The Eng* May 11, 18, the Lyon's, June 1-**88**
Hearst, George, por. *E & Min* * Mar 7-**91**

Heat, thermal quantities, graphic representation of, De V. Wood *Am M E* * v 11 -**90**; transmission through cast iron plates pickled in nitric acid, Carpenter, do. Royse * v 12, 12 -**91**; temp. taking by tuning forks *El Rev* Aug 15-**91**; proposed nomenclature in practical thermics, Wurtz *E & Min* Dec 14, 21-**89**

E News production from electricity, ed. Aug 9; mechan. equiv. of, Rowland's expts. for det., n Aug 16-**90**, do. De V. Wood *Steven's Indic* July 15, do. *Locom* Feb, do. *R & Eng* Feb -**88**, expts., Perot (full) *F Inst* Jan, Isherwood * Feb, Joule's equiv., Thurston, Apr -**92**, hist. of *Locom* Apr -**89**, do., Hanssen *Sc Am Sup* Apr 21, Wood, May 26-**88**. *J Gas Lt'ng*

F Inst temp., definition, theoret. and expt., Pictet and Isherwood, Sep -**88**; latent, of vaporization of volatile substances, Chappuis, Feb -**90**; and its mechan. applics. (lectures), bk. * *Inst C E* -**85**; measurement of high temps., Roberts-Austen, discuss. (full) * v 110 -**92**; absolute zero *Locom* Aug -**92**; radiant, instrums. for measuring, Boys (full) *Sc Am Sup* * Nov 23, 30 * Dec 7, 14-**89**; dilatation of metals from low temps., Andrews * Mar 15; measuring, Davis, Sep 13-**90**; transforming into mechan. energy, Melmer, Dec 5-**91**

MOTORS, Hargreave's thermo-motor *Sc Am Sup* * Feb 18-**88**, *Industries;* triple thermic, Haswell *Sc Am Sup* Apr 14-**88**, *Am C E*

REGULATING, Hawkin's aut. ap. *Am M E* * v 9 -**88**; Johnson's system, Chester *Soc Arts Mass* -**88**

Heaters, unbraced wrt. iron, heads *Locom* * Feb -**90**. See also BOILERS, feed-water heaters

Heating, ap., Hawkins aut. regulator *Am M E* * v 9 -**88**; house heating, L. Allen *E Mag* July – Sep -**92**; processes prog. and heavy chemical manuf. '90, Lunge (full) *E & Min* Apr 25-**91**; green-house, Conrad *E Rec* Mar 29; proportioning radiating surface, Carpenter, Nov 29-**90**; system on receiving tanks *Locom* * Jan -**90**; action from open grates, stoves and hot pipes, Dye (full) *Sc Am Sup* * Mar 12; gas production and ammonia, Hennin, Oct 15-**92**. See also CARS, heating

BOSTON Heating Co. plant, Abbott, insets *Am Min* * v 16 -**88**, notes *E News* Jan 14, Dec 8-**88**, plant *E Rec* * Apr 28 * May 5-26-**88**

MASS. Inst. of Tech. system, Boston *E News* * Feb 25 * Mar 3 * May 19-**88**

Heating, HOT water, and a steam plant, comparative test, Carpenter *Am M E* * v 11 -**90**; town heating by, Abbott *Eng* * Aug 30 * Sep 6-**89**; vs. steam *E Mag* * Sep -**91**; and steam plant, comparative test, diags. *E News* * May 24; of John Hopkins hos., bk. n. Nov 22-**90**; Westchester Cty. almshouse *E Rec* * Dec 3; and fitting, 31-**87** * Jan 7, June 23, 30, July 7, Aug 18, 25, Sep 15, 22, Oct 13-27, Nov 3 * Dec 15-**88** * Jan 5, 12, 26 * Feb 2-23 * Mar 2-16 * June 29, Mackay, Nov 30, Dec 7-**89**; simple arrangement * Oct 17-**91**; Nat. Bank building, Waltham, Mass., Sanborn * Apr 23-**92**; explosion of a hot water boiler *Locom* Apr -**88**; Baldwin, bk. review *R Gaz* May 17 -**89**

STEAM, Kortings low-pressure boiler *E Rec* * Nov 9-**89**; Plaza hotel, N. Y. * Dec -**90** * Jan; Trinity Church, N. Y. * 17-**91**; house boiler test, Baldwin, Apr 16-**92**. See also STEAM heating

Heating and ventilation, Sturtevant, pph., Boston, 1888; of an office and warehouse building, econom. method Snell *Am M E* * v 9 -**88**, do. *Eng* * Jan 6, do. *E News* * Jan 7-**88**; air vitiating properties of artif. lights, Lidy, table *El Rev* Sep 10-**92**; ventil., ed. *Eng* Dec 23-**92**; of homes and schools, L. Allen *E Mag* Apr, Aug, Sep; ventil. factory buildings, Snow * July -**91**

E Rec of buildings, Baldwin, Aug 31 * Sep 7, 14-**89**; schoolhouses, Aug 2-30, Sep 6, 13; Mass. Inst. of Tech. bld. * Nov 29-**90**; John Hancock bld., Boston * Feb 7; sanitation in schools * Apr 25 * May 2; Englewood, Ill., church * May 9; Pueblo opera house * 23, 30; N. Y. Music Hall * July 4; use of gas for, Fletcher, 11; John Hopkins hos., Balt. * 18 * Aug 1-15, 29 * Sep 5-26; U. S. Senate Chamber, Wash. * Oct. 3; Chicago schools * Dec 5-**91** * Jan 2-**92**

E Rec and plumbing, Duluth Union depot * Feb 6; N. Y. Music Hall * 6 * Mar 26; ventil. of the Sorbonne Amphitheatre * Feb 20; Syms operating theatre and effic. test * July 2; N. Y. residence * Nov 19, 26; Billings, Nov 19, Dec 10-**92**; of public blds., Elkinton *F Inst* Aug, do. *Locom* Sep; Jan -**89**; Eng. bld., Mass. Inst. Tech., Woodbridge * *Soc Arts Mass* -**90**, notes, do. *Tech Q* * May, new bld. do., insets, Oct * Dec -**88**

Heilner, Marcus, por. *E & Min* * Feb 14-**91**

Heliochromy. See PHOTOGRAPHY, heliochromy

Helme, William *F Inst* Aug -**88**
Helmholtz, Hermann Von, por. *El Wld* * Sep 3-**92,** por. (full) *Sc Am Sup* * Oct 10-**91**
Hemberow, Robert C. *Inst C E* v 92 -**88**
Henry, Joseph, por. *El Eng* * Mar 9-**92**
Heredity, Turner (full) *Sc Am Sup* Nov 2, 9-**89,** *Nature*
Hering, Carl, por. *El Eng* * Sep 24-**90,** por. *El Wld* * Mar 7 -**91**
Herz, Cornelius, por. *El Rev* * Dec 31-**92**
Hetherington, Thomas R. *Inst C E* v 101 -**90**
Hewitt, Abram S., presentation of the Bessemer medal, Kitson addr. *Am Min* v 19 -**91**
Highway eng., instruction in, C. Allen (full) *Soc Arts Mass* -**91.** See also MUNIC. eng; PAVING; ROADS; STREETS
Hilgard, Julius E. *Am C E* v 27 -**92,** por. *E News* * May 16 -**91**
Hills, Graham H. (full) *Inst C E* v 95 -**89**
Hindmarsh, Thomas *Inst C E* v 97 -**89**
Hingeston, Charles H. *Inst C E* v 104 -**91**
Hirn, G. A., Dwelshauvers-Dery *Eng* Jan 31, por. * Feb 14, *The Eng* Mar 21-**90**
Hobson, Anthony G. *Inst C E* v 91 -**88**
Hochhausen, William, por. *El Wld* * Oct 12-**89**
Hodges, Almon D. Jr., por. *E & Min* * July 18-**91**
Hodson, Richard *Inst C E* v 106 -**91**
Hofmann, Ottokar, por. *E & Min* * Aug 8-**91**
Hoisting, hydr. pier plant, Brooklyn sugar refining Co., Engel *Am M E* * v 12 -**91**; pneu., Wheeler *Am Min* * v 19 -**91**; elec. machinery, Bolton *El Rev Lond* May 6-**92**; pneu. vs. cable (mine), Wheeler *E & Min* * Oct 18-**90**; Carlin's friction drum power *E News* * Oct 25-**90**; Lidgerwood six spool engine * Feb 6; Otis machinery, Eiffel tower, Paris * Sep 8-**92**; Roth's machine *E Rec* * Dec 27-**90**; Teal's portable hoist, com. report *F Inst* * Oct -**89**; Hart's clutch-hoist, com. report * Nov -**90**; the Ulrich engine *Pwr* * July -**90**; Cal. & Hecla mining Co. plant *R Gas* * Mar 21-**90.** See also ELEVATORS; RAILROADS, incline — mt; WINDING engines
Holland and its people, Edmonde de Amicis, Putnam's, N. Y., Lond. * bk., 1890; dikes, notes on, Starling, insets and map, discuss. (very full) *Am C E* * v 26 -**92,** *R Gas* Nov 11-**92**; notes, Locke *E Rec* Dec 27-**90**

Holley, Alexander L., addr. at unveiling of por., Bayles *Am M E* v 12 -**91,** memorial addr., Dredge *Am Min* * v 20 -**92,** memorial statue, do. *Eng* Oct 10-24, addr., Dredge *E News* Oct 4, por. * 11, memorial *E Rec* Oct 11-**90**

Homeopathy, Helmuth (full) *Sc Am Sup* May 17-**90**

Homersham, Samuel C. *Inst C E* v 109 -**92**

Hopkinson, John, por. *El Wld* * Apr 11-**91**

Horse, origin, Huidekoper *Sc Am Sup* Jan 5-**89**; horse-shoe, hist. development, Zippelius (full) * Sep 12-**91**

Horse power, nominal *E News* June 30-**88**; steam, what does it cost, Pray *F Inst* June, July; constants table *Pwr* Sep, of boilers, com. report, Sep -**90**; brake, cor. *The Eng* July 8, 15 * Aug 12, 26-**92**

Hose, metal flexible, for air brakes *R Gaz* * Feb 6-**91**; expts. See FIRE streams

Hot air, and steam for power *Cassier's* Nov -**91**; friction in pipes, cor *Eng* * Jan 6-**88**; heating by, Chesebrough system *E News* Mar 10-**88.** See also HEATING

Hot air engines, McGahie *Cassier's* * Mar -**92**; Woodbury-Merrill's and tests *E News* * Sep 14-**89**; Benier's, abs. *Inst C E* v 92 -**88,** *Dingler* 267 -**88,** *Sc Am Sup* * Apr 27 * Dec 7, Paris exhib. *Eng* * Aug 30-**89,** *The Eng* * Sep 5-**90**; the Rider, Aug 10-**88**; Robinson's * Nov 28-**90**; Hargreave's *Pwr* * Mar -**88**; Woodbury's * Oct -**89.** See also THERMO-motor

Hot water heating. See HEATING, hot water

Hotel Mont Dore, Bournmouth *Eng* Mar 1-**89**

House, Royal E., por., Hovey *Sci Am* Dec 22-**88**

House, refuse disposal *Eng* May 15; drainage from the architect's point of view, Corser *E News* * Sep 19-**91**; do., Pierson *E Rec* Mar 8-**90**; do., ap. for cleansing and inspection *The Eng* * Feb 22-**89.** See also DRAINAGE; MUNIC. eng; REFUSE disposal; SEWERAGE

Houses, hist. of human habitations *Eng* * May 3; workmen's, Paris exhib. * Nov 1; the Ducker portable, n *E & Min* * Feb 2-**89**; hist. of dwellings, Garnier, Paris exhib. '89 *Sc Am Sup* * Oct 6-**88.** See also POMPEIAN house

Houston, Edwin J., por. *El Wld* * Sep 13-**90**

Howe truss prob., solution with a carpenter's square, Howe *R & Eng* * Oct **91.** See also BRIDGES, HOWE truss

Hughes, D. E., por. *Sc Am Sup* * Feb 8-**90,** *El Eng*

Humphreys, Henry T. *Inst C E* v 108 -**92**

Hunt, Henry A. *Inst C E* v 99 -**90**
Hunt, Robert W., por. *E & Min* * June 13-**91**
Hunt, Thomas S., por. *E & Min* * Nov 7-**91,** Feb 20-**92**
Hunter, William H. *Inst C E* v 109 -**92**
Huntington, C. P., por. *Cassier's* * July -**92**
Hurst, Thomas G. *Inst C E* v 103 -**91**
Hutton, Frederick R., por. *Cassier's* * Dec, por. *E & Min* * Nov 21-**91**
Hutton, Robert J. *Inst C E* v 104 -**91**
Hyde, Henry *Inst C E* v 91 -**88**
Hydrants, the Hayden fire-hydrant *E Rec* * Dec 31-**92.** See also FIRE hydrants
Hydraulic capstan, with variable power *Eng* * Jan 20-**88**
ENGINE, Pearsall's *Eng* * May 24-**89,** Draper *E & Min* * Oct 20-**88,** *E News* * Sep 28-**89**; pumping engine, do. *E Rec* * Sep 26-**91**
ENGINEERING, best form of nozzles and diverging tubes, Nagle *Am M E* -**88**; steps (shaft foot-step), anal. of, Hesse *Eng* * Jan 11, 25; St. Lazare R. station plant, Paris, inset * July 12, 19-**89**; Birmingham supply station * Feb 12, accums. * 26-**92** *E News* conundrum, cor. June 16, 30-**88**; formulas, diags. of, Fitzgerald, inset * Sep 6, correction, 13-**90**; in Mass., Fitz Gerald *E Rec* May 18, 25-**89,** *J Assoc E Socs;* expts., Holbrook, Sep 24-**92**; back water at bridge piers and other obstructions in streams, Bidone's expts., Frescoln *Lehigh Eng J* Feb -**89**; Glossop's pneu. power hammer *The Eng* July 27-**88**; monitors, Sep 11-**91.** See also ELEVATORS, hydr; HARBOR eng; NIAGARA Falls works
HOISTING plant, Engel *Eng* * Jan 16-**91**
LABORATORY, Mass. Inst. Tech., Swain * *Soc Arts Mass* -**90,** *Tech Q* Aug -**90**
LIFTS, balanced, Chatwood *Eng* * Jan 13; at Louviere, Canal du Centre, Belgium, inset * Feb 24, 24-**88**; St. Lazare R. station, Paris * July 12, chain elevator, 19-**89**; Samain's system, Cerbeland, abs. *Inst C E* v 99 -**90.** See also CANALS, lifts; ELEVATORS
MACHINERY, St. Clair tunnel *E News* * Dec 20-**90**
PRESS. See CROSS-ties, Aiken's hydr. machine; PRESSES
POWER distrib. in Lond., Ellington *Eng* Apr 27, discuss., insets (full) *Inst C E* * v 94 -**88,** abs. *R & Eng* July, *The Eng* May 11-**88.** See also POWER

Hydraulic PUMPS, compound plunger Woakes *Am Min* * v 20 -**92**; Buf Steam P. Co. compound duplex *E News* * Dec 13-**90**; pumping engine, Pearsall *E Rec* * Sep 26-**91**. See also HYDR. engines; PUMPS

RAMS, friction of, Tuit *Eng* * June 15-**88**; expts. *E News* Feb 1-**90**

WEIRS, movable, three designs for *E News* * Oct 18; Bazin's expts. with, diag. * Dec 27-**90**; aut. or balanced sluice for, Rosse, insets *Inst M E* * July, -**88**, *The Eng* Aug 3-**88**

Hydraulics, error in Enclyclopaedia Brittanica, Webb *Am M E* * v 10 -**89**; water power, Hiscox *Sc Am Sup* * Feb 7, 14, 28 * Mar 7, 14 * Apr 25 * June 6-**91**

Hydrogen manufacture *Sc Am Sup* * July 28-**88**

Hydrography and surveys, Barroll *R & Eng* Aug-Oct-**89**

Hygiene and demography, Internat. Congress of, pro. *E News* Sep 5, 12-**91**; lab. of, Univ. of Pa., Phil. *E Rec* Feb 27-**92**

Ice-bergs, North Atlantic *Sci Am* Oct 6-**88**

Ice-breaking steamers. See STEAMERS, ice-breaking

Ice-house, improved *R & Eng* Apr -**90**

Ice-making, L. Allen *E Mag* Mar; and ice, Prudden *Harper's M* * Aug -**92**; in the tropics *Locom* July -**90**; machines, vacuum *Sc Am Sup* * Feb 9, Pictet (full) * Nov 2-**89**, 25-ton plant * May 10, 150-ton, Linde system * July 5-**90**; Southby & Blyth's *The Eng* Dec 28-**88**

Illinois, three capitals, studies of the great West, Warner *Harper's M* * July -**88**

Illusions, optical, Zollner's, Jastrow *Sc Am Sup* * Nov 26-**92**

Immigration, the invasion of destitute aliens, Dunraven *19th Century* June -**92**

Impact, or the force of percussion, Hiscox *Sc Am Sup* July 9-**92**

Indexes, Index to Engineering Periodicals, 1883-87, inclusive, F. E. Galloupe, Boston '88, bk; General Index to Eng. News and Am. R. Journal, from Apr, 1872 to Dec 27, 1890 inclusive (Galloupe), N. Y., '91, bk; Descriptive Index of Current Eng. Literature, 1884-91, inclusive, Vol. 1, Assoc. Eng. Socs, Chicago, '92, bk.

E Mag of current eng. literature, files; do. *J Assoc E Socs* files; do. *Rev of Reviews* files; elec. storage batteries, references to periodicals, J. S. Brown *El W'ld* Dec 5-**91**; of current elec. lit., Am. Inst. Elec. Eng'rs, 1888, etc. n *F Inst* Feb

Indexes
-**88**; to reports of com. on science and the arts, of Franklin Inst., Pa. Dec -**90**, end
Sc Am Sup of chemical lit., com. report Dec 12-**91**, *Am. Assoc Adv Sci;* to lit. of the Butines and Halogen addition products, Noyes *Tech Q* Dec -**88**; to lit. of Angelic and Tiglic acids, 1842-92, Talbot (full) Apr -**92**
Index wheel exact subdivision, Rogers *Am M E* v 12-**91**
Indexing, laboratory and library, Parks, Bolles *El Wld* * Dec 3-**92**; ed. *E News* May 12-**88**, Mar 16-**89**; notes, memoranda and papers, care and classification *R & Eng* Sep -**91**
India, Agric. eng. in *Eng* * May 4, 18 * June 8, 22 * July 6 * Aug 3, 24 * Sep 7, 28 * Oct 19 * Nov 16-**88**; railroads and hydr. works *E News* Dec 22-**92**. See also IRRIG., India, Wilson
Indicators, continuous, Booth *R Gaz* * Oct 14-**92**. See also ENGINES, indicators
Indigo testing, comparison of methods, Cooley *Tech Q* Dec -**87**. See also DYES
Industrialism, Esson *El Rev Lond* Nov 7, 14-**90**
Industries, Am., influence of patents on, Mead *Cassier's* Dec; mineral, of Italy *Eng* Dec 9-**92**; soaps, Ivorydale plant (full) *E Rec* * May 2-**91**; development of Am. since Columbus, Durfee *Pop Sci* Dec -**90**, Jan, etc. -**91**; Am. industrial companies in the English market *R Gaz* Nov 1-**89**
Inglis, John *Eng* May 18-**88**
Inglis, William *Inst C E* v 101 -**90**
Injectors (steam boiler), mechanics of, Webb *Am M E* v 10 -**89**; steam, Carpenter (full) *Cassier's* * Jan-Mar -**92**; Schaeffer & Budenberg's re-starting *Eng* * Apr 13; combination aut. * June 15-**88**; Seller's * Nov 22-**89**; the ejector and its work, Hiscox *E Rec* * Nov 19-**92**; Gresham & Craven's aut. *R & Eng* * Aug -**88**; McDowell's check valve *R Gaz* * July 24-**91**; Met. double-tube * Dec 2-**92**; the Penberthy *The Eng* * Aug 15-**90**. See also EJECTORS; STEAM injectors.
Inks, two bottle marking, Wright *Sc Am Sup* July 4-**91**; exam. of, Schluttig, Mar 19; writing, chem. exam. of, Robertson, Dec 3-**92**; the Sheaf, Lincoln, Eng. *The Eng* * Aug 1-**90**
Innes, Edward A. R. *Inst C E* v 92 -**88**
Inspectors, forms for reports, Buf. Roch. & Pitts. R. *E News* May 12-**88**

Instruments, CHAINS. Gunter's, origin, ed. *E News* July 22-**89**
CONICOGRAPH, R. A. Harris, n *Sc Am Sup* * Mar 8-**90**
CURVE ranger, Trotter's *Eng* * Dec 6-**89**, *E News* * Jan 18-**90**, *The Eng* * Oct 30-**91**
CURVE-rule. Bradley's flexible. n *R & Eng* * Nov -**90**
PLANE table, the Pierce *Eng* Feb 17, *E News* Mar 10-**88**
PLANIMETER, spherical, Hele Shaw *Eng* * Sep 21-**88**; polar do., Cox *E News* * Mar 21-**91**
RANGE finder, Fiske's (gunnery at sea) *Eng* * Apr 24; the Weldon *E News* * Nov 14-**91**, *Eng*. See also GUNNERY, range finders
RODS, stadia and level, Lyons, cor. *E News* * Nov 8-**90**. See also SURVEYING rods
TACHEOMETER (surveying), Kennedy, inset *Inst C E* * v 99 -**90**
TAPES, use of, J. B. Johnson *E News* Mar 3, 10-**88**. See also ALCOHOLOMETER; ASTRON., instrums. — heliometer; COMPASS; COMPTOGRAPH; CONICOGRAPH (vel. registering); DRAWING; ELEC. ammeters — chronograph — telemeter, etc.; GALVANOMETERS; GRAPHOPHONE; INDICATORS; INTEGRATORS; MUSICAL; PHONOGRAPH; PLANIMETER; PYROMETERS; R. trains vibrations; SCHISEOPHONE; SEISMOGRAPH; SLIDE rule; SPECTROSCOPE; SPEED recorders; SURVEYING; TELEGRAPH; TELEPHONE; TELESCOPE; THERMOGRAPH; THERMOMETERS; WATER-manometer, etc.
Insurance, History of in Phila. for Two Centuries, Fowler, Review Pub. Co., Phil., '88, bk. *F Inst* Sep -**88**; Nat. provident, ed. *Eng* Aug 21-**91**. See also ELEC ins; FIRE — LIFE ins.
Integrator, Pearson *Eng* * Jan 31-**90**, new *Sc Am Sup* * Mar 21-**91**; integrating machine, Abdank *Sci Am* Dec 22-**88**
Inventions, new and patented, notes, Richards *Cassier's* * Oct-Dec; and life of T. A. Edison, por., Dickson * Nov * Dec -**92**; of Henry Pinkus of Pa., Tanner *El Rev Lond* * Jan 8-22-**92**; elec., how to make great, E. P. Thompson *El Eng* Dec 17-**90**; what constitutes an invention and pat. law, Lowrey (full) *El Rev* Mar 8-**90**; effect of, Brackett, Apr 18-**91**; progressive * Jan 2-16-**92**; Edison's, at Paris exhib., Hammer *El Wld* Aug 31 * Sep 7-28 * Oct 5, 12, exhibit * Nov 16-**89**; how to make, Pentz *E Mag* * Apr; employee's ownership of, ed. *E News* Feb 20; property in ideas, ed. *R & Eng* Dec -**92**; great mechan., of French origin *The Eng* Sep 6-**89**. See also ELEC. inventions

Iridium *El Rev Lond* Feb 19-**92**

Ireland, stats., Carbutt, Pres. addr. *Inst M E* July -**88**

Iron *Am Min* Canadian trade, Bartlett (full) * v 16; two conditions of phos. in, Cheever, v 16-**88**; det. of silicon in ferro-siliceous, Williams, v 17 -**89**; influence of silicon on det. of phos. in, Drown, v 18 -**90**; and labor, Hewitt, Pres. addr. (full) * v 19; manuf., probable future, Bell, v 19 -**91**

Eng manuf., Bell, Sep 20, 27; and silicon alloys, Hadfield, Oct 18, 25-**89**; changes in thermal treatment, Ball * May 30-**90**; Brit. trade, July 3-**91**; elim. of sulphur from, expts., Ball, June 3, 10, do., new proc., Saniter, Oct 7; indus. of Spain, ed. Dec 2-**92**; market as a barometer of trade, Shriver *E Mag* June -**91**

E & Min making cost at Sheffield, Ala. July 21, cost in Troy, Nov 3; in Mex., Chism, 10-**88**; market review, '87, Jan 7-**88**, Jan 12-**89**; recalescence of, Hopkinson * May 11-**89**; European indus. '89, May 2, June 7; trade, thirty years' retrospect, Kent * Sept 27, Oct 4-**90**; elim. of sulphur from, Stead, Oct 15-29, Nov 12-26, Saniter's proc. Dec. 10-**92**, *I & S Inst*

Inst C E molec. changes in at high temps., Temnikoff abs. v 91 -**88**; effect of pickling on strength, Ledebur, abs. v 104, influence of heat on do., Martens, Bodmer * 104 -**91**; class. of various forms of, Stassano, abs. v 107 -**92**; produc. '91 *R & Eng* Mar -**92**; effects of silica and aluminum in working *R Gaz* Dec 7-**88**; recalescence of, Hopkinson *Sc Am Sup* July 6-**89**. See also BLAST furnaces; CAST iron; COAL, bitum., pyrites; FOUNDRY; IRON and steel—pig iron; RAILS; ROLLING mills, etc.

Iron and steel *Am Min* det. of phos., Shimer, v 17 -**89**; internat. standards for anal., Am. com. work, Langley, v 19 -**91**, n v 20; ap. for manip. plates during finishing proc., Curtis, inset * v 20; physical and chem. equations of open-hearth proc., Campbell, discuss. v 20 -**92**

Eng strength, Kennedy, Mar 8; scientific investigation applied to manuf., Wright, Dec 20-**89**; effect of temp., Osmond, May 16; industries in '89, Jean report, June 13-**90**; cost of production, U. S. Gov't. report, Oct 23-**91**; Brit. and foreign trades, Feb 19; production of pure, Dyer, June 10-**92**; industries of Am. (U. S.), Kitson *E Mag* July -**91**, *Contemp Rev*

E & Min U. S. produc. '88, Jan, May 12, July 28-**88**; manuf.,

Iron and steel
France, Feb 22-**90**; market review, '89, Jan 4, pig iron produc., Feb 1-**90**, trade '90, market review (full) Jan 3, 3; ap. for es. carbon in, Lunge, July 18-**91**; produc. '91, review (full) Jan 2; non-oxidizing annealing proc., H. Jones, 9; produc. '91, German Empire, n May 21-**92**
E News English trade, '87, Jan 28-**88**, prices in England for five years, n Aug 2-**90**; trade in U. S. and Great Brit., '87, report Am. I. & S. Assoc., June 9; tetrabasic phosphate, Reese, Aug 11; concrete and, adapted to resist transverse strains, Percy * Sep 8; silicated, J. B. Johnson report, Dec 1-**88**; output for '88, Feb 2-**89**, produc. of world since 1830, table, Apr 5, North, cor. 12, for '89, Feb 1, May 17-**90**; manuf. status. ed. May 4; U. S. stats. June 1-**89**; bar iron, Chic. prices, 1881-90, diag. * Mar 7-**91**; Am. and foreign stats., '91, June 2; purification from sulphur, Saniter, Nov 24-**92**
R & Eng Am. trade, '87, Feb; resistance formulas, Bricka, Mar; chrome, pig iron and steel, Brustlein, abs. Aug -**88**; produc., 6 months to Jan 30, '89, Sep -**89**
R Gas U. S. produc. and prices, June 1-**88**; physical props. at high temps., Howard, May 9; produc. of world, future seat of, Atkinson, Oct 10; open-hearth, effect of punching and reaming expts., tables, Blakely * Dec 12-**90**; anal. *Sc Am Sup* * Sep 1 -**88**; accomplishments, Kitson, June 22-**89**; convention, Pitts. pro. (full) Oct 25-**90**; properties at higher temps., Howard (full) *Soc Arts Mass* -**90**; influence of silicon on det. of phos. in, Drown *Tech Q* May -**89**
The Eng strength, internal stresses of cast iron and steel, Kalakoutsky, Jan 20, 27, Feb 17, Mar 2, 16, 30, Apr 13, 27; Am. notes, June 29; how to analyze, July 20, Aug 17, 31; chem. processes involved in rusting of, A. C. Brown, Sep 7-**88**, *I & S Inst;* at Paris exhib. *The Eng* Nov 1-15; scientific investigation as applied to, Wright, Dec 27-**89**, Jan 3-**90**; desulphurization, Saniter, Dec 23-**92**. See also METALLURGY; STEEL
ADAMS' direct process, Howe *E & Min* * Nov 22-**90**
ALABAMA and coal industries, '88, Phillips *E & Min* Jan 12-**89**. See also ALABAMA
AM. Assoc. an. report *E & Min* Apr 27-**89**; stat. report, pph. review *R Gas* May 1-**91**
BETHLEHEM Co. works, Pa. *Eng* * Mar 7 * Aug 29-**90**
BIRMINGHAM, Ala. industry, Kent *Cassier's* * Mar -**92**

Iron and steel, BLOOMING mill shear table, Lack. I. & Coal Co., Scranton, Pa., *Eng* * May 15-**91**; bloomery proc., Otschersk works, Haltzoff, abs. *Inst C E* v 92 -**88**. See also IRON and S., Husgafvel

CARBON Co's modification of reducing proc., A. E. Hunt, n *Am Min* v 17 -**89**; direct proc. of manuf., do. *E News* Mar 24, Apr 14-**88**

CARBURIZATION of, Roberts-Austen *Eng* May 16, *Locom* July -**90**

CAST iron, Stewart's receiver for melted *The Eng* * Mar 6-**91**. See also CAST iron

CHARCOAL Iron Workers, Journal of, U. S. Assoc., Phil. *E News* 8 -**89**

CHARGING crane, hydr., inset *E News* * Feb 7-**91**

CHATEAUGAY ore and concen. plant, N. Y. *E & Min* * Nov 3 -**88**

FOUNDER'S Soc. *Eng* Jan 11-**89**, report, Feb 21-**90**

FOUNDING, moulder's snap flask *E News* * Aug 2-**90**. See also FOUNDRY

FURNACES, Siemens', Addie *Eng* July 24-**91**; Lash open-hearth, A. Hunt *E & Min* * July 7-**88**, *Am Min*; cupolas, various kinds for pig iron melting, Gouvy *F Inst* * Dec -**88** * Jan -**89**. See also BLAST furnaces; FOUNDRY

GLENMORE iron estate, Greenbrier Cty., W. Va., Page *Am Min* * v 17 -**89**

HUSGAFVEL'S high bloomery for producing direct from ore, Garrison *Am Min* * v 16 -**88**, *E & Min* * Feb 4, abs. *Inst C E* v 91 -**88**

INSTITUTE, Great Brit., pro. *Eng* May 11-25, Aug 24, 31-**88**, May 10-24, Paris, Sep 20, 27, Oct 4, Creusot, 11-**89**, May 9-23, in Am. Oct 17-31 * Nov 7. 21, 28-**90**, May 8-22, Oct 9-**91**, June 3, 10; Sep 23, 30-**92**; *E News* Oct 4, 11, Kitson addr. 18, 25, Nov 1-22-**90**, Nov 7-**91**, Oct 27-**92**; *The Eng* May 11, 18, Aug 24, 31-**88**, May 10, 17, Sep 27-**89**, in Am. Oct 24, Nov 7, 21, 28, Dec 5, 26-**90**, * Oct 9-**91**, Sep 23, 30 -**92**

MAGNETIC concentration, at Mich. I. mine, L. Superior, Fowle *Am Min* * v 19 -**91**; do., Hoffman and discuss., use of concentrates, Langdon, det. of iron in the tails, in Port Henry blast furs., Landis, v 20, 20-**92**, do. Hoffman *Eng* Nov 13-**91**, do. *E News* Oct 17. do. at Croton mag. iron mines. Brewster. N. Y..

Iron and steel
do. *E & Min* Oct 31-**91**; magnetization of, C. Jones, Nov 8-**90**; the Hoffman concentrator *E News* * Dec 26-**91**; concen., Birkinbine, abs. *Inst C E* v 97 -**89**; of iron ore, Chase *Tech Q* Apr -**92**
MAGNETIC separators, the Lovett-Finney *E & Min* * Nov 21; the Hoffman * Dec 12-**91**; development of mag. separation, Sahlin * June 11-25; the Chase * July 2, do. *E News* * Sep 1-**92**; sep. of from ores, Prus, abs. *Inst C E* v 103 -**91**, *Genie Civil* * v 17 -**90**. See also MAGNETIC separators
MALLEABLE, manuf. of contin. sheets direct from fluid metal, H. Bessemer *E & Min* * Oct 24, do. *E News* * Oct 24-**91**, *I & S Inst Lond*
METALLURGY, Brit. contribs. to, Kitson addr. (Bess. invention) *Am Min* v 19 -**91**; German practice, prog. since 1876 and basic proc., Wedding *E & Min* * Dec 20-**90**. See also METALLURGY
MINES and mining, in U. S., ed *Eng* Nov 27-**91**
CAMBRIA I. Co., Johnstown, Pa., map *E & Min* * June 8 -**89**
CHAPIN mine, L. Superior, Larsson, inset *Am Min* * v 16 -**88**, *The Eng* * May 31-**89**
CROTON magnetic, pyrites in, Hoffman *E News* July 28-**92**, *Am Min*
CUBA, Am. *R Gas* Apr 1-**92**
IRONSTONE mining in Cleveland, England, I'Anson *Eng* * Nov 25-**92**
LONGDALE Co. mines, Va., methods of working and surveying, Johnson *Am Min* * v 20 -**92**, *E & Min* * Aug 1-**91**
MINNESOTA Co., Soudan, filling system, Bacon, abs. *Inst C E* v 110 -**92**, *Am Min*
NEW Jersey industry review, Smock, insets *Am Min* * v 20 -**92**, *Eng* Oct 9-**91**
NEW York mining industry for past decade, Smock *Am Min* v 17 -**89**
TILLY Foster mine, re-opening, McDowell *Am Min* * v 17 -**89**, *E & Min* * Sep 7-**89**
MOULDING sand mechan. treatment, Bagshaw *E & Min* Feb 28-**91**, *Inst M E*
NEW Jersey industry, Smock *Eng* Oct 9 -**91**, *Am Min* * v 20 -**92**

Iron and steel, ORES *Am Min* carbonate discov. at Enterprise, Miss., Brainerd; mode of deposition, Menominee Range, Mich., Fulton; a crystalline sub-sulphide of iron and nickel, Mackintosh * v 16, 16-**88**; prominent sources of supply, Birkinbine, concentration of, do; notes on roasting Hudson river carbonates, Olmstead * v 17, 17 -**89**; desulphurization of pyritiferous ores, Valentine, v 18 -**90**

Am Min prog. in mag. concen., Birkinbine; L. Superior, anals. of, Goetz; of U. S., Sterry Hunt; magnetization of C. Jones; elec. ore dressing at Tilly Foster mine, McDowell; Ontario magnetites, Ledyard; of Va., and development, Pechin, v 19, 19 -**91**; sampling, Landis, n; of Danville, Pa., Stock * v 20, 20 -**92**; supplies *Eng* May 10-**89**

E & Min dressing of non-bessemer, Maynard, Kunhardt, Mar 31, Apr 7-**88**, *Sch Mines Q;* at Buena Vista, Va., Pechin *E & Min* * Aug 3-**89**; U. S., T. S. Hunt * Nov 22, 29-**90**, do. produc., '89-'90, May 2, do., '89, Birkinbine, Cen. bull. Oct 17; of Minn., Winchell, bk. review, July 4-**91**; Vir. Oriskany, Pechin, Aug 13; granulation by crushers and rollers, Sahlin *E News* July 14; 20 years U. S. produc., diag. Nov 3-**92**; of U. S., Birkinbine *F Inst* Sep, *Sc Am Sup* Oct 6-**88**. See also IRON and steel, magnetic concentration — separators

PARK Gate works, Stoddart *Eng* Aug 8, *Inst M E* July -**90**

PICKLING, brittleness induced by, Ledebur, abs. *Inst C E* v 92 -**88**, *Stahl & Eisen* v 7 -**87**

PIG-iron *Am Min* cost of a ton in the Sequachee Valley, Bowron: of unusual strength, Dewey; hollow patterns, Fackenthal; ferro-silican and the econ. of its use, Keep; Birm., grading of, Robertson, n * v 17, 17 -**89**; hist., Kent, n *Cassier's* Jan., indus., recent changes, do. * June -**92**; valuation of, Tucker *Eng* July 20-**88**; gamble in, ed., diag. * May 23; U. S. produc. Oct 10-**90**; sulphur elim. from, Massenez * Oct 16-**91**

E & Min cost of making in South and West, Pechin, Aug 4; cost of a ton in Sequachee Val. Town, Bowron, 18-**88**; U. S. produc., '88, Feb 2-**89**, census, Aug 30-**90**, '90, Jan 31-**91**, '91, Jan 30-**92**

E News coal iron ore and steel, world's produc. of, Swank, Feb 8, since 1840, diag. * May 10; Am., cost of, table, Aug 9; growth of production, 30-**90**; desulph. by manganese, Mason * May 26-**92**; relation between physical properties and chem. constituents, Outerbridge *F Inst* * Mar -**88**; manuf. develop-

Iron and steel
ment in U. S., Birkinbine, Nov, Dec -**91**; grading of, Grammer *Lehigh Eng J* Oct -**88**; produc. in '88 *Locom* May -**89**
R Gas produc. in '89, Jan 31-**90**, and steel rail, '91, Jan 29-**92**; Outerbridge *Sc Am Sup* * Apr 14-**88**; silicon in, C. Jones * Sep 21-**89**; elim. of sulphur from, Massenez * Nov 21-**91**; how forms in blast furnace, see BLAST furnaces
PRESERVATION, protection from corrosion, Hydrogen proc. *E News* Mar 31-**88**; of structural work *E Rec* Apr 18, *R & Eng* Apr -**91**
ROBERT process for *Sci Am* Mar 16-**89**, *Harper's W*
ROLLING mills, evolution of, R. Hunt *Am M.E* v 13 -**92**; suspended feed table, Morgan *Am Min* * v 19 -**91**, do. *E & Min* * Dec 13-**90**; Jardine's screwing gear *Eng* * Oct 16-**91**; Schutz-Knaudt Co., Essen * Sep 2, 16-**92**; universal, for girders and cruciform sections, Sack *Sc Am Sup* * July 20, do. *E & Min* * June 8; Seaman's univ. * July 13; rolling steel rails, Nicholson * Nov 30-**89**; evolution of Am., Hunt, Nov 21, 28-**91**; rolling fluid metal, Bessemer's early expts. *E News* Oct 24, Dec 26-**91**; St. Jacques works *Sci Am* Feb 9-**89**
RUSSIAN sheet iron manuf., Garrison *E & Min* Dec 1-**88**
SAINT Chamond Co., Paris exhib. *Eng* * Sep 13-**89**
SCHUTZ-Knaudt works, Essen *Eng* * Sep 2, 16-**92**
TESTING, notes on steel tested after rolling, Felton *Am M E* -**88**; structural wrt. iron, tests and requirements, A. Hunt (full) *Am Min* v 20 -**92**, n p 771, do., *Eng* Nov 20-**91**; Swinburne *El Rev Lond* * Sep 19-**90**; proper tests for, J. B. Johnson *E News* * Sep 14-**89**; structural, Hunt, Apr 16-28, elastic curve of, Henning, May 26-**92**, do. (full) *E Rec* Nov 7, 14-**91**. See also TESTING
WELDING iron and nickel, nature of, Fleitmann, abs. *Inst C E* v 96 -**89**, *Stahl & Eisen* -**89**

Ironing machine, cloth *Sc Am Sup* * May 10-**90**

Irrigation, Powell *Century* Mar-May, ed. *R & Eng* June; large canals, Anderson, July -**90**; underground waters of arid regions, Hill *E Mag* Aug; prob. in the West, H. Wilson, insets * Dec -**92**; in U. S. *E & Min* Nov 17-**88**; in arid West, Hinton * Jan 5; appliances, n * Apr 6-**89**; prog. in West, Powell, Jan 2-**92**
E News in the West, Brisbin, Apr 28, ed. June 30; abroad, June 9, Sep 15; in arid regions of U. S., Powell, Nov 3-**88**;

Irrigation

cost of, Oct 5-**89**; ditches and 'New Era' grader, cor. Mar 15; probs., relation to forest conditions, Fernow, report, Sep 6-**90**; U. S. publications, Jan 24; what the Gov't. is doing, H. Wilson, Dec 19, 26-**91**; prog in U. S. Mar 5, units, correction n, 12; in western U. S., map * Sep 29; earth and masonry dams for, Follett *E Rec* May 14, 28; arid regions of U. S. (a great domain), Irwin *Forum* Feb -**92**; Am. irrig. eng., Wilson, abs. *Inst C E* v 107 -**92**, *Am C E* v 25 -**91**

ARIZONA, in, Newell *Tech Q* Apr -**91**

AUSTRALIA, in *E & Min* Oct 27, ed. *The Eng* Oct 12-**88**

CALIFORNIA, San Diego flume *E News* June 29-**89**; mining ditches in and loss by evap. Mar 8-**90**; system in San Bernardine Cty., Finkle, July 4 * 25, Aug 8-29; Alessandro district, Oct 17-**91** * Feb 6; Cucamonga Fruit Land Co. (full) * Sep 29-**92**; Southern and artes. wells, San Bernardine Cty., Fox *Inst C E* * v 105 -**91**; Hall *Sc Am Sup* Jan 4-**90**

COLORADO, laws in *E News* Dec 29-**88**; Henry *Sc Am Sup* Apr 6-**89**

EGYPT, storage reservoirs proposed, Willcocks, bk., map *E & Min* * Mar 1-**90**; and the Raijan reservoir, Whitehouse *E News* Nov 9, do. *R & Eng* Dec -**89**; Barois, abs. *Inst C E* v 91 -**88**; report '90, Ross (full report see) v 107 -**92**; *The Eng* Dec 14, 21-**88**, Dec 4-**91**

FLUME, San Diego *E News* June 29-**89**; the Laybourn iron * Oct 17-**91**

IDAHO *E News* Jan 4; Foote report * Apr 26-**90**

INDIA, in, H. Wilson, discuss., insets (full) *Am C E* * v 23 -**90**, do. *E News* Nov 21-**91**; canals, report, Nov 10-**92**; in Mysore *E & Min* * May 10-**90**; works, Mullins *E Rec* * Dec 5-**91** * Dec 2-**92**; works, 1887-88, stat. review, pph., abs. *Inst C E* v 99 -**90**; Culcheth, abs. v 108 -**92**; Barois *R & Eng* Nov, Dec -**92**, etc. *An Ponts;* as profitable eng. works *The Eng* Sep 6-**89**

ISLAND of Oahu, Hawaiian group *E News* Dec 14-**89**

MACHINERY for, hydr., expts. on, Caligny, abs. *Inst C E* v 92 -**88**, *Compt r* 105 -**87**; on Pacific coast, Richards, insets *Inst M E* * Feb -**88**

MONTANA, n *E News* Mar 30-**89**

NEW So. Wales, M'Kinney, abs. *Inst C E* v 100 -**90**

OREGON, Newell, Cen. bull. *E Rec* May 14-**92**

Irrigation, PERIYAR works, Chatterton *Eng* * Feb 6-**91**; project, Mackensie * Nov 25 * Dec 2, inset, 9-**92**
SPAIN, Llaurado *E News* Jan 28; India and Italy, June 9, Sep 15 -**88**
UTAH, Bear river Canal, Wilson *E Rec* Sep 19-**91**, *Am C E*
WYOMING, Mead report *E News* Aug 2-**90**
Italy, industries of *Eng* Dec 9-**92**; irrigation *E News* June 9, Sep 15-**88**; ports of, Gatto, abs. *Inst C E* v 104 -**91**; Italian army, Goiran *Harper's.M* * Aug -**92**
Ivory, artificial *The Eng* Oct 16-**91**

Jackson, Edward R. *Inst C E* v 100 -**90**
Jackson, John *Inst C E* v 105 -**91**
Jacobi (electrotyping inv.), por. *Sc Am Sup* * June 8-**89**
James, William *Inst C E* v 99 -**90**
Japan, floods and earthquakes *E News* * Nov 30-**89**
Jeffreys, Edward A. *Inst C E* v 96 -**89**
Jenks, Charles W. *El Eng* Apr 30-**90**
Jet, propulsion, Webb *Am M E* * v 12 -**91**, reaction of a liquid, do. *F Inst* * Jan -**88**; propulsion, do, abs. *Sc Am Sup* Aug 8 -**91**, *Am M E*
Jetties, at Eston *Eng* * Jan 20; for improving estuaries, Haupt *F Inst* Apr -**88**; ocean, in N. So. Wales, Harper, n *Inst C E* v 102-**90**. See also HARBOR eng., jetties; N. Jersey coast movements and jetty reaction; RIVERS, Miss. jetties, etc.
Jewels, precious stones in the last decade, Kunz *Soc Arts Mass* -**88**. See also PRECIOUS stones
Jigging, English vs. Continental system, Munroe (full) *Am Min* v 17 -**89**
John, W. *Eng* Jan 2-**91**
Johnstown, Pa., flood disaster *E News* * June 1, ed. 8, 15, 22, map * July 13; * Aug 17; drainage area of South Fork basin * Sep 14-**89**. See also FLOODS
Jones, Francis W., por. *El Eng* * July 1-**91**
Jones, Thomas P., Fowler *F Inst* July -**90**
Jones, William G. *Inst C E* v 109 -**92**
Jones, William H. *Inst C E* v 92 -**88**
Jones, William R., Raymond *Am Min* v 18 -**90**; por. *E & Min* * Oct 19, por. *E News* * Oct 12-**89**
Jopling, Frederick *Inst C E* v 101 -**90**
Joseph, Thomas *Inst C E* v 103 -**91**

Joule, James P. (full) *El Rev Lond* Oct 18, por. *El Wld* * Nov 23, *E News* Oct 26, por., n *Sc Am Sup* * Dec 14-**89,** *Eng* Jan 31-**90,** *The Eng* Oct 18-**89**

Journals, roller bushings in at low vels. and high pressures, Warner *Am M E* -**88**; Wood's bearings *Eng* * Aug 29-**90.** See also CARS, axle-boxes and, etc; ENGINES; LOCOMS., etc.

Journals, technical, in Am., Werner, pors. *Cassier's* * July -**92**

Kansas, the central state, physical features and residences, Hay *Harper's M* * June -**88**; Kansas City traffic *R Gaz* July 8 -**92**

Kaolin, (clay), Blandford, Mass., Crosby *Tech Q* Aug -**90**; in Ashland, Mass., Hollis, Apr -**92**

Keefer, Samuel (full) *Inst C E* v 103 -**91**

Keefer, Thomas C., por. *E News* * Jan 21-**88**

Keely motor *Eng* * Dec 20-**89**

Kennedy, Rankin, por. *El Eng* Oct 14-**91**

Kiddle, William W. *Inst C E* v 98 -**89**

Kinetograph, Edison's, ed. *Eng* June 5-**91**

Kirchhoff, Gustav R., por *Pap Sci* * May -**88**

Kirk, Alexander C. *Eng* Oct 7, 14, *The Eng* Oct 7-**92**

Kleberg, Charles G. *Inst C E* v 94 -**88**

Knife polisher, Pinchbeck's *The Eng* Apr 27-**88**

Knitting, without weft, Paget *Eng* * July 19, 26-**89,** high speed, do. * Feb 14-**90**; framework, Rowlett *Sc Am Sup* * May 5 -**88**

Koch, Robert, and discovs., por. *Sc Am Sup* * Dec 27-**90**

Kowaletski, Sophie, Barnum *Sc Am Sup* May 7-**92**

Kukuanaland, the army of, Michaelis *F Inst* Oct -**89**

Labor, Looking Backward (year 2000-1887) Bellamy (fiction), Ticknor, Boston, 1888, bk; premium plan of paying for, Halsey *Am M E* v 12 -**91**; iron and labor, Hewitt, Pres. addr. (full) *Am Min* * v 19 -**91**; studies of factory life, the village system, Wyman *Atlan M* July -**88**; piecework or daywork *Cassier's* Nov *Eng* Aug 28-**91**

Eng French, ed. Oct 11-**89**; profit sharing, ed. Jan 3-**90**; recent movement of wages and working hours, ed. Nov. 13-**91**; methods of indus. remuneration, Schloss, bk. review, Mar 4; in Austria, ed. Sep 16; in Belgium, ed. Oct 7; new movement, ed. 21; in Italy, ed. Nov 11-**92**

Labor

E Mag industrial discontent, Pentecost, July; iniquity of leasing convict, Roberts, Sep -**91**; socialism and indus. conquest, Black, Sep; Homestead strike, Hawthorne, Sep; troubles and the tariff, Harrah, Dec -**92**; question, striking coal miners, Raymond *E & Min* Jan 14-**88**; Pitts. iron workers' wages scale, July 29; Homestead wages scale, July 20-**89**; and legislation, ed. Oct 1; and contract, Nov 12, 19-**92**

E News strikes, two years, record of in N. Y. state, Apr 14-**88**; premium plan of paying for, Halsey, July 18; hours of English railway servants, ed. Oct 17-**91**; the mod. prob., ed. (full) Sep 1-**92**; do strikes pay *Locom* Apr -**88**, *Iron Age;* the invasion of destitute aliens, Dunraven *19th Cent* June; question, labor leaders on, Burns, Burt, Champion, Hardie, Woods (full) Nov, Dec -**92**; economic outlook, Wells *Pop Sci* May -**88**; fallacies of mod. economists, Kitson, Dec -**92**

Sc Am Sup the laborer and his employer, Walker (full) June 1-**89**; the tendency of trades unions, Spencer (full) May 9-**91**; profit sharing, Gilman, arbitration and conciliation in Mass., Walcott *Soc Arts Mass* -**89**; organization in the docks *The Eng* Sep 6-**89**; hours of different countries, May 6-**92**. See also CAPITAL and labor; RAILROADS, labor

Laboratories, Sibley Coll. eng., Carpenter, insets *Cassier's* * Dec -**91**; eng., of Mass. Inst. Tech., Lanza *Tech Q* * May -**88** * May -**90**. See also ELEC. — ENG. — PHYSICAL labs., etc.

Labyrinths *Sc Am Sup* * Sep 13-**90**

Lake dwellings, ancient *Sc Am Sup* Aug 17-**89**

Lakes, great, water level and rainfall of, Crosman, diags. *E News* * Oct 6-**88**; U. S., growth of traffic on, July 12; commerce, Dec 13-**90**, do., Brock report, Sep 15-**92**; great, traffic and shipping on *R & Eng* June -**91**; frt. traffic of the great, Cen. bull. *R Gas* Mar 27-**91**; commerce of great and Miss. river, Sep 30-**92**; hist. of great Am., Newberry *Locom* Feb -**90**, *E & Min*, do. *Sc Am Sup* Oct 19-**89**; great, Oct 27-**88**

ABOUKIR, reclamation, Sheppard *Inst C E* v 101 -**90**

CONSTANCE, Switz., survey, Haid, abs. *Inst C E* v 97 -**89** * *Zeit Vermess* -**89**

ERIE, currents observations, Rice *E Rec* June 14-**90**

MOERIS, Egypt, restoration *Sc Am Sup* Feb 25-**88**

SUPERIOR region, resources of, Birkinbine, inset (full) *Am Min* * v 16-**88**; mining region, DeLand *El Wld* Aug 2-**90**

L'al, Rái B. K. *Inst C E* v 94 -**88**

Lambert, George N. R. *Inst C E* v 103 -**91**

Lamps, safety, in collieries, Preece *Eng* June 15-**88**; heat generated by gas and oil, table *R Gaz* Dec 2-**92**; Harcourt's Pentane standard, Clifford *Tech Q* May -**90**. See also ELEC. lamps — lighting; HEATING and ventil; LIGHTING

Land, dry, ht. and vol. of, depth and vol. of the ocean, Murray *E News* Jan 14; New York city, value, ed. Mar 31-**88**; French defences, the Mougin oscil. cupola *The Eng* * Nov 29-**89**. See also SURVEYING.

Landing stage for piers, floating, Vic. pier, Folkestone *The Eng* * Nov 29-**89**

Landscape gardening, possibilities, Wolf *E Mag* Oct; beauty at Newport, DeWolf * Dec -**91**; eng., Tuxedo Park, Haring * Jan -**92**

Landslides, the Quebec *E News* * Nov 2-**89**; Or. & Cal. R., Curtis *R Gaz* * Aug 28-**91**; land-slip at Zug, Switz., abs. *Inst C E* v 95; in polder, Is. of Noord Beveland, Lambrechtsen, abs. v 96 -**89**, *Tijd Konink Ings* -**88-89**

Lane, Moses, por. *E News* * May 17-**90**

Lange, Hermann L. *Inst C E* v 109-**92**

Languages, Hubert *Inst C E* v 107 -**92**; teaching and learning mod., Kroeh *Sc Am Sup* Mar 31-**88**; mod., value to the student of science, Van Daell *Soc Arts Mass* -**91**; language of the 'life of Thomas Becket,' Emery *Tech Q* Feb -**90**

Lantern, Ives portable projecting, com. report *F Inst* * Mar -**90**; development of gelatino-bromide plates *Sc Am Sup* May 25-**89**. See also MAGIC lanterns

Lanyon, Charles *Inst C E* v 98 -**89**

Lard testing for cotton seed oil, Pattinson *Sc Am Sup* June 15-**89**

Larsen, Jorgen D. *Inst C E* v 104 -**91**

Lastarria, Victorino A. *Inst C E* v 96 -**89**

Lathes, lathe bed strains, Bissell *Am Min* * v 13, *Iron Age* * Dec 8-**92**; universal hand, Brown & Sharpe *Eng* * Sep 6-**89**; heavy crankshaft *Sc Am Sup* * Aug 16, do. *Eng* * Apr 25; Anglo-Am. * May 16-**90**; for rose turning * Aug 19-**92**; Urquhart's crank-pin, n *R & Eng* * Apr -**89**; 5-inch geometric *The Eng* Feb 17-**88**; Hunt's screw cutting * May 3-**89**

Latimer, Charles, Weston *J Assoc E Socs* Nov, por. *E News* * Apr 7-**88**

Latrobe, J. H. B., por. *Sci Am* Apr 6 **89**

Lattice work machine *Sc Am Sup* * Nov 22-**90**

Launches, elec., Reckenzaun (full) *El Eng* Aug 13-**90**; elec., on the Thames, Forbes *El Wld* Oct 5-**89**; Yarrow's vapor, the 'Zephyr,' expts., ed. *Eng* May 25; steam launch Victoria * Dec 28-**88**; French naphtha launch engine, *R & Eng* * Dec -**89**, *Industries; E News* Aug 23-**90**; the Snark spirit *The Eng* Oct 19, Dec 14-**88**; the Robinson petrol. engine * Sep 11, 18 -**91**

Launching, ship, statics of, Baxter, abs. *Inst C E* v 110 -**92**, *U. S. Naval Inst* v 18 -**92**. See also SHIPS

Law, legal decisions, notes *E News* Oct 11-25, Dec 13, 20-**90**; public rights in private property, Fisher *St R J* May -**92**; evidence, accuracy, see OBSERVATION, average. See also ELEC Co.'s., Edison — lamp, incand. pats. decisions; MINING; PHOTOGRAPHY, the law and; PRICE regulating; SURVEYING

Lead, produc. and trade, '87 *E & Min* Jan 7-**88**, Jan 12-**89**; and copper cupolas, temp. in, and aluminate slags, Henrich, Dec 27-**90**; in '89, Jan 4-**90**, in, **90**, Jan 3; and zinc mining, U. S., Kirchhoff July 11-**91**; U. S. produc. '91, Jan 2; blast fur., cal. of charge, Hofman, bk. (full) Sep 3, 17-**92**

BONNE Terre, Mo., St. Joseph Co. dressing works, Munroe, insets (full) *Am Min* * v 17 -**89**, (full) *E & Min* * June 22, 29-**89**

SMELTING, cast-steel water-jackets, note on, Terhune *Am Min* v 17 -**89**; Lewis & Bart. bag proc. of collecting lead fumes at Lone Elm works, Joplin, Mo., Dewey (full) * v 18 -**90**, do. abs. *Inst C E* v 102 -**90**; roasting vs. fusing, Newhouse *E & Min* Feb 28-**91**; slag pots, Hofman * Dec 31-**92**

Leadville, Col., geol. and mining indus., U. S. Geol. Survey monograph 12, Emmons, bk. review *E & Min* Apr 7, May 12-**88**

Leather, from tannery to dynamo, Schieren *El Eng* * Mar 2, *St R J* Mar, *Sc Am Sup* Mar 19; elec. tanning, Worms & Bales' rapid proc. * July 9-**92**, *Genie Civil;* leather-making (Am. Indus. development), Rich *Pop Sci* * July -**92**. See also BELTS

Leather, Samuel P. *Inst C E* v 98 -**89**

Ledger, James C. *Inst C E* v 100 -**90**

Lee, Henry *Inst C E* v 97 -**89**

Lee-Smith, Hamilton *Inst C E* v 99 -**90**

Le Mesurier, Henry P. (full) *Inst C E* v 98 -**89**

Length, standards of, Bond *Soc Arts Mass* -**88**. See also WEIGHTS and measures

Leslie, Frederick *Inst C E* v 98 -**89**

Leslie, Henry H. *Inst C E* v 98 -**89**
Leslie, James (full) *Inst C E* v 100 -**90**
Leveson-Gower, Granville G. *Inst C E* v 104 -**91**
Lewis, H. C. *F Inst* Aug -**88**
Lewisohn, Leonard, por. *E & Min* * Oct 3-**91**
Library, indicator for books, n *E News* Jan 24-**91**; Nat., at Wash. *Sc Am Sup* Dec 31, of the U. S. (Libr'y of Congress), Spofford *Forum* Nov -**92.** See also BUILDINGS, library
Lid, annular, strains on resisting internal pressure, Rutherford *Am M E* * v 10 -**89**
Life-boats, Henderson's collapsible *Eng* * Apr 12-**89**; models, expts., Corbett * Apr 25-**90**; steam, Jan 23-**91**, do. 'Duke of Northumberland' *E News* * Sep 27, do. *The Eng* * Sep 5, 12, do. hydr. jet-propelled *Sc Am Sup* * Oct 4-**90**; collapsible * Aug 10-**89**; models, expts., Corbett (full) * June 7-**90.** See also LIFE-saving
Life-buoy, the Franklin *Eng* * Nov 20-**91**
Life insurance, life-expectancy rule *Locom* July -**86**; the expense margin in, Wills *Sc Am Sup* Jan 31-**91**
Life-saving, and salvage str. Aid, inset *Eng* Mar 4; U. S. Service, Piper *F Inst* Jan; devices, Woolven *Sc Am Sup* * Apr 2, 16-30 * May 14 * July 2, 9, 23 * Aug 20, 27 * Sep 10 * Oct 1, appliances * Dec 10-**92.** See also LIFE boats—buoys; U. S. Life Saving Service
Lifts. See ELEVATORS; HYDRAULIC lifts
Light, photometry, personal error in, Nichols *El Eng* * July -**89**, new photometer, do. * May 28, do. *El Rev Lond* July 4-**90**; photometric research, R. C. Richards * Mar 27 * Apr 3 * Sep 4 -25, Oct 2, 9, 16-**91**

El Rev and color, Spice, Mar 30; and electricity, identity of, Herz, Dec 14-**89**; new photom. notes, Nichols, May 31; units of light and brightness, Weber, Sep 6; Varley's photom. * Oct 18; artificial, of future, Nichols (full) * Nov 29-**90**

El Wld photometry, personal error in, Nichols * June 1-**89**; new photom., do. * May 31; the Bolometric spectrometer * June 21; artif., of future, Nichols (full) * Nov 29, discuss. Dec 6-**90**; photometers * Apr 25-**91**; Hering's portable photom. for st. lights and illum. * Jan 16-**92**

Eng refraction goniometer, Trotter * May 17-**89**; illum., distrib. and measurement of, do. *E News* * Nov 24, do. and discuss. (full) *Inst C E* * v 110-**92**; the ether-oxygen lime light,

Light

Ives *F Inst* * Jan -**88**; mod. conception of (full) *Locom* Nov -**90**

Sc Am Sup and color, Abney (full) * Mar 2-23; optical torque, S. P. Thompson (full) * Aug 10 * Sep 21; mod. theory, Lodge, 28; effect on matter, Abney, Oct 5-**89**; the spectrum and its development, Yeo (full) * Feb 1, 8; radiophony, Bell, May 10; artif., of the future, Nichols (full) Dec 13-**90**; optical projection *The Eng* * Apr 22-**92**. See also COLOR; ELEC. light; GASEOUS illuminants; LIGHTING

Light-houses, Sautter, Lemonnier & Co's exhibit, Paris *Eng* July 19-**89**; illuminants, ed. Oct 31; stability, E. Schmitt, cor. *E News* * Dec 6-**90**; fog or dipping ap. for elec. light in, Stevenson, inset *Inst C E* * v 92 -**88**; French, n *R & Eng* * Apr -**90**, *Genie Civil;* oils, Edwards (full) *Sc Am Sup* Mar 19; lens (large), Wigham, June 11, do. *The Eng* Apr 22-**92**; elec., Scand. exhib., Copenhagen, Nov 9-**88**; Douglass * Mar 29-**89**. See also WAVE pressure on structures

BISHOP'S Rock and Tory Is. *Eng* Feb 26, Douglass, illum. by gas, Salmond, discuss., insets *Inst C E* * v 108 -**92**

BULL Rock, So. Coast Ire. *Sc Am Sup* * Oct 5 *The Eng* Aug 23 -**89**

CAMPEN and illum. of Lower Ems, Riensberg, abs. *Inst C E* v 103 -**91**, *Zeit deut Ing* -**90**

DIAMOND Shoal, Outer, Cape Hatteras, N. C., proposed *E News* Oct 5-**89**, inset * July 26, 26, Aug 2, inset * 9, *R Gaz* May 30 -**90**

EDDYSTONE model, Naval exhib., Lond *The Eng* * Apr 10 -**91**

FINLAND, recent, Strukel, abs. *Inst C E* v 110 -**92**, *All Baus* -**92**

GIBB'S Hill cast iron tower, Bermuda *R & Eng* * Feb -**89**

HATTERAS light contract, ed. *E News* May 31-**90**. See also LIGHT-house, Diamond

MEW Is., Dublin, Griffith, insets *Inst M E* * July -**88**

OLD Orchard Shoal, N. Y. harbor *E News* * Feb 6, *R & Eng* * Mar -**92**

OYSTER Is., Burmah *The Eng* Sep 13-27-**89**

ST. Catherine's Point, Isle of Wight, most powerful light in world, Douglass *Sc Am Sup* * July 21 *The Eng* June 15 -**88**

Lighting, artif. illum., effic. of methods, Nichols (full) *El Rev Lond* * Apr 12, 19, do. (full) *El Wld* * Mar 30, do. abs *Inst C E* v 97 -**89,** do. (full) *El Eng* * Apr -**89**; artif. of future, do. (full) * Nov 26-**90**; elec., relation to optical science, Boyle (full) *El Wld* * Nov 14-**91**; compressed oil-gas, Ayres *Eng* Apr 13-**88**; the Wells system *E News* * Aug 10-**89**; illum. and ventil., Lewis *E Rec* Jan 11-**90**; Welsbach system, Granger *F Inst* * May -**88**; developments in artif. illum., Morton *Sc Am Sup* Mar 16-**89**; by compressed oil-gas * July 26-**90**; Harcourt's Pentane standard lamp, Clifford *Tech Q* May -**90.** See also ELEC. lighting; GAS-lighting; LIGHT

Lights, st. and illum., Hering's portable photom. for *El Wld* * Jan 16-**92**; contractor's portable *E News* * Nov 16-**89**; the ether-oxygen lime light, Ives *F Inst* * Jan; the Lucigen, econom. illum. from waste oils, Hannay *Sc Am Sup* * Jan 14; floating, 8-ft. cyl. lanterns *The Eng* Nov 9-**88.** See also ELEC. lighting and lights

Light-ship No. 5, with elec. lights, U. S. *R & Eng* * Aug, abs. *Inst C E* v 106 -**91**

Lightning *El Eng* Varley Sep-Dec -**88**; arresters and photog, study of self-induction, Acheson (full) * Feb; conductors and arresters, Brit. Assoc. discuss. Apr, May -**89**; arrester, Westinghouse * Apr 9; the Wirt arrester * May 7; conductors, Lodge, July 2-**90**; protection, Hodges * Feb 11, Hubbell, June 17-**91**; arresters and discuss. of non-arcing metals, Wurtz (full) * Mar 23-**92**

El Rev Lond Varley, July 20 – Oct 12, Nov 2, rotary motion, Parker, Dec 14-**88**; arresters and self-induction, Acheson * Feb 1, 15; Lodge (full) May 3-24 * June 6-20; conductors, Varley, July 5 * 19, Aug 9, Oct 4, 18-**89**; connection, Fischer, Jan 24, 31, Feb 7; Mar 14-28; Apr 4, 11; conductors, Varley, May 24, 31, June 7-21; thunderstorms, Hazen, Aug 15; protection of buildings, Bennett, Oct 10-**90**; damage, curious case, Hands, Jan 8, protection, do. Feb 19-**92**

El Rev peculiar motions of, Parker * Nov 24-**88**; arresters and self-induc., Acheson (full) * Jan 19-**89**; arresters and discov. of non-arcing metals, Wurtz * Mar 26; rods, McAdie, Sep 17-**92**

El Wld protection of elec. light stations, Jenks (full) * Aug 18; rotary motions in, Parker, Nov 24-**88**; arresters and self-induc., Acheson (full) * Jan 19, Brown, Child * Feb 23-**89**; Lodge's protectors (wires) * May 17; and the elec. spark, Bid-

Lightning
well * July 19-**90**; rods, E. Thomson, June 27-**91**; caprices, Hering * Jan 16; arresters and discov. of non-arcing metals, Wurtz (full) * Mar 26 * Apr 2, 9-**92**

Eng protection from, ed. Aug 3 * Sep 7; conductors, Brit. Assoc. pro. Oct 19, 26; flashes * Dec 21-**88**; rods, E. Thomson *E Rec* July 11-**91**; Jove's autograph, Jennings, insets *F Inst* * Jan -**92**; conductors, Kohlrausch, abs. *Inst C E* v 93 -**88**; do., connecting with water and gas pipes, Weber, abs. v 95 -**89**; conductors, Frisch report *Sc Am Sup* Jan 26; discharge, influence of gas and water pipes, Wilde, Aug 3-**89**; protection of chimney shafts, Molyneux, Wood, Apr 19-**90**; rod protection, Hodges, Apr 18-**91**; peculiar rotary motion of and elec. curs., Parker * *Soc Arts Mass* -**89**

Limberg, Charles T., por. *E & Min* * Apr 25-**91**

Limestone industry, Day *Sc Am Sup* July 25-**91**

Lime sulphite fibre manuf. in U. S., Michaelis and discuss., chem. of the processes, Griffin *Am C E* * v 20 -**89**, do. (full) *Sc Am Sup* Jan 11-25-**90**

Lindley, Robert C. *Inst C E* v 92 -**88**

Linnæus, por. *Sc Am Sup* * Feb 18-**88**

Liquids, self-acting, measuring ap., Monte-jus *Eng* * Dec 12-**90**; compressed, dilatation of, Amagat *F Inst* Sep -**89**; heating and concentrating by steam, Hudson *The Eng* Apr 11, 18 * May 23 * June 6, 13-**90**

Liquors, aging, Turner's ap., Ramsay's proc., Stauffer *Sc Am Sup* * Sep 10; and preserves manuf., Brevans * Nov 19, 26 * Dec 3-31-**92**, etc.

Liverpool, works at *Inst M E* July -**91**. See also under DOCKS — WATER-works, etc.

Locomotives, Catechism of the Locomotive, Forney, bk. (very full) *R & Eng* * Jan -**88** - Oct -**89**; effic. of, Dixon *Am M E* * v 11 -**90**; econ. of the, Bell *El Wld* May 24-**90**; practice, ed, *Eng* June 29-**88**; express pass., Paris exhib., inset * July 5, do. ed. 26, Aug 2, 9; Brit., cost of working, table, Nov 8-**89**; tank express double bogie, Brunner, cor. * Sep 26-**90**

E News oscillations registering ap. Feb 8; frt., for So. Am. (meter gauge) * May 17; effic. of, Dixon, Aug 16-**90**; of world, n Oct 20-**92**; vibratory movements of and on timing trains and testing R. tracks, Milne, discuss., insets *Inst C E* * v 103 -**91**; speed and power, Hill * v 109-**92**; shipping at high

Locomotives

speed *Locom* July, *R Gaz;* of future, n *R & Eng* Feb -**88**; problem, Apr * July -**92**

R Gaz marine practice and locom. construct., ed. June 15; road foreman (duties), Oct 12; cost of rebuilding, 19-**88**; proportions, cor. (full) Apr 26; Paris exhib. * July 19, Aug 16; coal consumption as affected by enginemen, Baker, Aug 2, 30; R. I. works and Schenectady heavy express * Oct 25-**89**; effic., Dixon and ed. May 23, 23, ed., June 13: minimum curvature, ed. * Oct 3-**90**; free steaming, essential qualities, Mitchell, Jan 23; wheel wts. of heavy, Kruttschmitt * May 22-**91**; power, suburban pass. trains * June 10-**92**; waters for, Gibbs *Steven's Indic* July 15-**88**

The Eng cost of parts in U. S. Jan 13; single vs. coupled, Apr 13; express, designs, cor., Nov 23; engine resistance, ed., Nov 16, 16, Dec 7-**88**, *E News;* repairing, Barker *The Eng* Feb 21; speed, ed. May 30; how propelled, cor. * Oct 31-**90**; mod. constuct. * Jan 1, 8 * Feb 5, Apr 22 * May 6, 20 * July 8, (brass foundry) Oct 21 * Nov 4 * Dec 30-**92**

ABT, Manitou & Pike's Peak R. *R Gaz* * Feb 6-**91**

AIR-pump governor, Barnes', Wabash R. *The Eng* Oct 19-**88**

AMERICAN, in New So. Wales *E News* July 21, Aug 18 * Sep 22; and English, wts. comparison, Purdon, Oct 20; exhib., Dec 22-**92**, *Industries;* and English, speeds *Locom* July -**89**; and English, eds. *R & Eng* July - Dec -**90**, eds., May, Aug, Nov, Dec -**91**, Jan, tables (full) Feb, (full) June, Aug -**92**

R Gaz in New So. Wales, cor. June 1-**88**; and English, ed. Apr 25, (full) May 9-**90**, Dean, July 10, relative merits, Forney (full) Nov 27-**91**, *R & Eng*, (proportions), table, ed. *R Gaz* May 6-**92**; practice in Am. *Sc Am Sup* * Nov 23-**89**

The Eng Am. practice * May 3 * June 21, July 19, 26, Sep 6-**89** * Jan 3, 31 * Feb 28 * June 6 * Oct 17, and English, ed. Nov 7-**90**, trials, ed. Feb 27, vs. English, Dean, and ed. July 24, 24-**91**, Feb 26, Mar 4, 11, exhib. of, Apr 1, May 27-**92**

AM. Master Mechanics' Assoc. reports *R & Eng* July -**90**, pro. (full) *R Gaz* June 19, 26-**91**, *The Eng* July 12-**89**. See also RAILROADS, Master Mechanics

BALDWIN, works erecting shop *R & Eng* * Dec -**90**; No. 10,000 *R Gaz* * Sep 27-**89**; Erie, 10-wheel express, inset * June 13-**90**; varieties built, June 5-**91**; in New So. Wales (full) July 15, Aug 19, *The Eng* July 1, Sep 23-**92**

Locomotives, BALT. & Ohio, consol. *R Gaz* * Aug 2, 30; pass. * Sep 6-**89**; 10-wheel, tests, ed. (full) * Nov 27, 27 * Dec 11 -**91**; 6-wheel switcher, inset * July 22-**92**

BELGIAN, State R's, express pass., Paris exhib. *Eng* July 5, 5, *The Eng* * May 3, 31, 31-**89**; goods, Paris exhib. * Jan 24-**90**

BELL-ringer, steam *R Gaz* * Mar 8-**89**; White's pneu. * Aug 8 -**90**

BENGAL & No. W. R., India, and rolling stock, Rhind, insets *Inst C E* * v 91 -**88**

BLAST, pipe, influence of intermediate tuyeres, Fliegner, abs. *Inst C E* v 91 -**88**, *Schweiz Baus* Nov 5-**87**; nozzle, Adams' variable *R & Eng* * Oct -**90**, *Eng*; pipes, Kordina's vortex *The Eng* Jan 20-**88**

BOILERS, strains in, Randolph *Am M E* v 9 -**88**; imps. in construct., Hickey *E News* * Apr 4-**91**; construct. and effic., Sheffield *Inst C E* * v 109 -**92**; *Locom* Nov -**88**; ed. *R & Eng* Oct -**88**; without stay-bolts, Bork * May; expts. with, rate of combust., B. & O., temp. in smoke-boxes, Wells, ed. * Aug -**90**

R Gaz water circulation, Hackney, Dec 28-**88**; grate areas proportions, ed. Apr 5; tubes length, ed. Nov 15; tube and rivet table, for spacing, Dec 27-**89**; C. B. & Q. experimental * Jan 3; Leach, N. E. R. Club discuss. Apr 11; expts. with tubes of varying length, Paris, Lyons & Med. * July 4-**90**

R Gaz stay-bolts, N. E. R. Club discuss. Mar 20; construct. imps., Hickey * Apr 3; incrustation, treatment of waters used, Barr, Nov 13, discuss. Dec 4-**91**; stay-bolts in, Cole * Jan 8; steel plates specs., Eastern R. of France, Feb 19; Phil. & Reading express, inset * Mar 18; care of, in Algeria, Bates * July 22 * Aug 19; scale and feed water purification, Sep 30-**92**; Dean *Sc Am Sup* Feb 20-**92**, *Nat Car and Lo Bldr*

The Eng Leach's flexible stays, Feb 10-**88**; steel, Lond. & N. W., Webb * Oct 18 * Dec 6-**89**; experimental (compound tubular), Chemin de fer d l Est, France * Nov 13-**91**; construct. * Jan 1, 8 * Feb 5; Leahy, cor. * Apr 22; double, Eastern R., France * Mar 4, 11; Great Western, converted * Oct 21, 28-**92**

ALTOONA and Penn shops, notes, ed *E. News* Apr 26-**90**

BELPAIRE, and the radial stay, and ed. *R Gaz* * Aug 1, cor. * Sep 26, 26-**90**; 62-in., Ill. Cen. * Nov 20-**91**

CLEANER, the Trowbridge *R Gaz* * Jan 17-**90**

Locomotives, EXPLOSIONS, remarkable, Atlan. & Pac. *E News* * Jan 14-**88**; remarkable, Norwegian State R's * June 7-**90**; on Brit. R's *R & Eng* * Jan-Apr -**88**; in Europe *R Gaz* * Jan 18-**89**; in France and Algeria *The Eng* Aug 31, 31-**88**, in France since 1840 *An Indus* July 29-**88**; France, Belgium, Holland and England *The Eng* Jan 11 * Feb 1, 22-**89**

FIRE-boxes, the Darby crown sheet, Grand Trunk R., Can. *Eng* * Aug 24-**88**; Webb's * May 17, 17; corrug. steel, Lond. & N. W., Webb * Aug 23-**89**; the steam-jet as a means for preventing smoke *E News* * Apr 4-**91**; ed. *R & Eng* Jan; corrug. tubular, Knaudt, abs. June; fire-brick lined (full) * Oct, Phelps, cor. Nov -**89**; corrug., Lentz, Apr -**90**; Forney's door opener * June; corrug. * Sep -**91**

R Gaz and coal burning, Higginson, and ed. July 20-**88**; Master Mechanic's com. report, June 27-**90**; staying, Woods, Apr 17; Hawksworth's door opener * May 1; Ten Brinck fuel saving tests, Orleans R., France * 8, 22-**91**, *Ing Civils*; Webb's steel *The Eng* * June 14-**89**

JOHNSTONE compound *R Gaz* * May 27-**92**

KNAUDT & Pohlmeyer's, Prussian State R's *Eng* * Oct 4, *R Gaz* * Nov 15-**89**

LENTZ'S stayless *Eng* * Dec 19, *R Gaz* * Apr 4-**90** * Jan 9 -**91**

SPEIRS' construct. *E News* Jan 23, Dean, 30, (full) *R Gaz* Jan 22-**92**

WOOTTEN, U. Pac. express pass. *R Gaz* * June 15 * July 6-**88**

BOSTON & Albany 4-wheel switching *R & Eng* * Nov, Dec -**91**

BRAKE gear diags., Am. Brake Co., cor. *E News* * Jan 26-**89**

BRISTOL & Exeter express *The Eng* * May 9, 9-**90**

BUILDING, Am., '88, n *Eng* Mar 8-**89**; in New So. Wales, June 6-**90**; in '89 *E News* Feb 1; 40 years' course of, French, inset *The Eng* * June 20, July 18-**90**

CAB, Balt. & Ohio *R Gaz* * Dec 16-**92**

CALEDONIAN R. bogie pass. *The Eng* Apr 13, 13-**88**; No. 123, performance, diags. * Mar 13-**91**

CANADIAN Pac. 10-wheel heavy pass., inset *Eng* * Jan 17, inset *E News* * Aug 30-**90**; mogul, inset *R Gaz* * May 31, inset *The Eng* * June 21-**89**

CAPE Gov't. R's, coal burning of Colonial coal on, Stephens. insets *Inst M E* * Jan -**90**

CAVAN R., light locom. *The Eng* Apr 20, 20-**88**

Locomotives, CHESAPEAKE & O. 10-wheel pass., Rogers works *R & Eng** July -**90**; tank switching, 2500 gals. *R Gaz* * July 27-**88**

CHICAGO, Bur. & Q. pass., inset *E News* * June 28; standard mogul * July 5-**90**; suburb. pass., inset, ed. *R Gaz* * Dec 13-**89**; 75-ton decapod, Rogers works, inset * July 24-**91**

CHICAGO, Mil. & St. P. express *R Gaz* * Feb 20, details * Mar 6-**91**

CLEVELAND, Cincin. Chic. & St. L. *R Gaz* * Jan 1-**92**

COALING chutes *R Gaz* * Dec 11, 18-**91**; coaling stations, Berg, Feb 5 * 19-**92**

COMPOUND *Eng* E. Worthington, Jan 11; Lapage * Mar 22, 29 * Apr 5-**89**; English pats. on, abs., Feb 27, Apr 17-**91**; Sinclair *E News* Apr 20; Am. * Nov 30-**89**; Am. Master Mech's com. report, and ed. June 28, 28-**90**

E & Min compounding petrol. refuse burning, Russia, Urquhart, abs. Sep 14-**89**, insets, discuss. (full) *Inst M E* * Jan -**90**; Lapage, discuss., insets * Jan -**89**; the compound principle applied to, E. Worthington, insets *Inst C E* * v 96-**89**; Polonceau, n v 99 -**90**; Brueckmann, abs. v 104 -**91**, *Soc Ing Civils* Oct -**90**; relative value of different types, abs. *Inst C E* v 106 -**91**, *Am Mas Mech* 24th report

R & Eng 4-cyl., Bousquet, and ed. * Mar -**89**; Master Mech's com. report, July -**90**; development of compound system, Mallet (full), Feb, ed. * Mar - June -**91**; Webb, Jan; early description, n * June, ed. Sep -**92**, *F Inst*

R Gaz in Am. service, ed. * Feb 15, 22; Sinclair, N. E. R. Club discuss. Apr 19; May 10; starting power of, Neale, cor. Aug 16; Barnes, discuss. Oct 18: India, Hughes * Nov 22; ed. * Dec 20-**89**; mathematics of, French, Mar 7; Polonceaux, Apr 18; Master Mech's com. report, June 27; early, Perry & Lay * Sep 19-**90**

R Gaz pats. on (list), Feb 13, English * 20; braking power of steam cyls. of * Apr 3; relative value of different types, Master Mech's discuss. * June 26; cyl. proportions, Oct 2; U. S., table, Dec 18-**91**; in frt. and pass. service, Woods, Jan 1; trip-expan. n May 13; three-cyl. * Dec 30; Master Mech's com. report, abs. July 1, (full) *Ry Age* sup. June 24-**92**

Sc Am Sup compound prin. applied to locoms., E. Worthington, Mar 30-**89**; steam distrib. in, Snow * May 10-**90**, *R Mas Mech*; comp. prin., Worthington *The Eng* Jan 25-**89**; cyls., Harrison, cor. * June 6-**90**; Rickie, cor. Oct 23-**91**

Locomotives, COMPOUND, ARGENTINE Great Western, burning liquid fuel *The Eng* * May 15-**91**
ARGENTINE Midland R. *The Eng* * Dec 27, 27-**89**
AUSTRALIA, Baldwin, tests of Vauclain (full) *R Gaz* May 29 * Aug 7-**91**
BALDWIN four-cyl. and ed. *R Gaz* * May 2, 2-**90**; * May 1, table, Nov 27-**91**. See also LOCOMS., comp., Balt.
BALTIMORE & O., Baldwin, details, inset *E News* * May 3, 3, tests of and ed. Sep 6 * 13, 13, narrow-gauge * Dec 13; tests, Barrus (full), and eds. Sep 12, 12, 19 *The Eng* * Sep 19, 26 -**90**
BATCHELLER'S pat. valve *R & Eng* * May; R. I. Locom. works, Franklin Inst. medal *R Gaz* June 3-**92**
BROOKS two-cyl. *R Gaz* * Nov 25-**92**
CHICAGO Mil. and St. P. tests, inset *R Gaz* * Aug 5, 5-**92**
DEAN'S *R Gaz* * Nov 25-**92**
EAST Tenn. Vir. & Ga. indic. diag. *E News* * Nov 22-**90**; ten months' test of, Dec 5-**91**
FRENCH *R & Eng* * Aug -**89**; recent *R Gaz* * Jan 3-**90**
GERMANY, in, Stambke *E News* * Apr 19, May 3-**90**
GRAZI-Tsaritsin R. goods, petrol. refuse, Urquhart *The Eng* * Jan 31-**90**
HUNGARIAN State R's *E News* * Feb 6-**92**
JOHNSTONE'S double truck, Mex. Cen. *E News* * Aug 29-**91** * Mar 12-**92**; abs. *Inst C E* v 106 -**91**; Mex. Cen., tests (full) *R Gaz* * May 22, 29, Oct 9; 10-wheel, inset * June 5; trials anal., cor. Sep 25-**91**; double bogie, Mex. Cen., inset * Mar 25, test * Aug 26 (full) * Dec 30, 30-**92**. See also LOCOMS., comp., Mex. Cen.
LAKE Shore & Mich. So. frt. *R & Eng* * Dec -**92**
LINDNER'S starting gear, system for *E News* * June 16, do. *R & Eng* * Dec -**92**, do. *R Gaz* * Nov 15-**89**; do. in Russia * Mar 13, 27-**91** * Sep 2-**92** *The Eng* * May 23-**90**
LONDON & No. W., Edinb. exhib., inset *Eng* * July 25-**90**; Webb's, with Joy valve gear *E News* * Jan 26-**89**; frt. *R & Eng* * Feb; Webb's *The Eng* Dec 21, 21-**88**
MALLET'S, Decauville R., Paris exhib. *Eng* * May 3, do. *E News* * June 1-**89**; largest and smallest *R Gaz* * Aug 15-**90**; prog. in use of * Feb 6, arguments pro and con, Polonceau, 13-**91**, *Ing Civils;* Paris exhib. *The Eng* * May 24 -**89**

Locomotives, COMPOUND, MEYER-Lindner duplex, Roy. Saxon St. R. *R Gaz* * Sep 2-**92**

MEXICAN Cen. 10-wheel Johnstone's double truck, inset *E News* * Aug 29-**91** * Mar 12, inset (full) * 26 * Apr 2, valve motion * 9-**92**; Johnstone, tests *R & Eng* * June, n Aug -**91**, Nov -**92**, do. *R Gaz* May 29, Oct 9-**91**, test * Aug 26-**92**

MEXICAN National R., dimens., news n *E News* Dec 13 -**90**

MICHIGAN Cen., Schenec. works *Eng* * Apr 4-**90** *E News* Jan 25, and ed. * Mar 8-**90**; ed. *R Gaz* * Jan 31, ed. Feb 14-**90**; 10-wheel pass. * Jan 23-**91**

MISSOURI, Kan & Tex., and simple, comparative tests *R Gaz* Nov 11-**92**

NORTH Eastern R., England, express, Worsdell, inset *Eng* * Mar 30 * Apr 13-**88** * June 21, 21-**89**; pass do. *R & Eng* * May -**90**; tank engine *The Eng* Oct 26, 26, goods tank, Nov 23, 23-**88**; express, inset * Feb 28 * Mar 7-**90**

NORTHERN R. of France, goods, Paris exhib., inset *Eng* * Dec 6-**89**; 4-cyl. fast pass., Bousquet, n *R & Eng* Jan * Aug *R Gaz* * Aug 12 *The Eng* * Sep 2-**92**

PARIS, Lyons & Med. R. *The Eng* * Aug 9-**89**

'PENN,' the *R Gaz* * May 3-**89**

PITKIN'S pat. *R & Eng* * Mar -**90**

PRUSSIAN State R's, goods, Worsdell system, inset *Eng* * Feb 1-**89**

RHODE Is. Locom. works, com. report, insets (very full) *F Inst* * May -**92**; Batcheller, bk. review *R & Eng* Jan -**91**; test in express service, Jan -**92**; and simple, study of, expts. *R Gaz* * Jan 9; system of (full) * Dec 11-**91**

RUSSIA, petrol. fuel, Urquhart *Eng* Feb 7 * 21 * Mar 7, do. *E News* * June 14-**90**

ST. Gothard R., duplex *E News* * Aug 15-**91**

ST. Petersburg & Warsaw R., pass., inset *Eng* * Sep 9, *R & Eng* * Nov -**92**

SAXON State R's express, dimens. *R Gaz* * Nov 22, 29-**89**

SOUTHERN Pac. *E News* * Apr 28-**92**; 10-wheel, inset *R Gaz* * Sep 11-**91**

SWISS, Jura-Berne-Lucerne R., pass. mogul, inset *Eng* * Feb 7; *R Gaz* * Sep 12-**90**

TESTS, Baldwin, Balt. & O. and ed. *E News* * Sep 6, 13, 13; Union El. R., Brooklyn, in fast pass. service, Dec 27-**90**

Locomotives, COMPOUND, TESTS
* Jan 3; 10 months, E. Tenn. Vir. & Ga. Dec 5, 12-**91**; Vauclain * June 23, ed. 30, 30, indic. diag. * July 7-**92**; Johnstone, Mex. Cen. *R & Eng* * June * Aug; W. N. Y. & Pa. R. Oct -**91**; R. I. works, in express service, Jan; Johnstone, Mex. Cen. Nov -**92**
R Gaz B. & O., Barrus, (full) Sep 12, 19-**90**; R. I. works expts. * Jan 9; Johnstone's (full) * May 22; Vauclain, May 29, * Aug 7; Johnstone, trials anal., cor. Sep 25; and simple, comparative, W. N. Y. & Pa. Oct 2, Baldwin, Mex. Nat. Dec 4-**91**; Johnstone, Mex. Cen. * Aug 26; and simple, comparative, Mo. Kan. & Tex. Nov 11-**92**; comparative, Hudson *Sc Am Sup* Jan 23-**92**, *J Assoc E Socs;* B. & O. *The Eng* * Sep 19, 26-**90**
VALVE gear, variable expansion, Dunlop, cor. *Eng* * Feb 13-**91**; for Hope & Co., cor. *R Gaz* Sep 19-**90**
VAUCLAIN, 4-cyl. *E News* * May 3-**90** * Feb 20; tests * June 23, ed. 30, 30, indic. diags. * July 7-**92**; com. report *F Inst* * July -**91**; patent, n *R & Eng* Jan -**90**; tests *R Gaz* May 29, Australia, Baldwin, tests * Aug 7-**91**; Manitou & Pike's Peak rack R., n * Aug 12-**92**
VON Borries', starting valve for (full) *R Gaz* * June 12-**91**. See also LOCOMS., comp., Worsdell & Borries
WEBB'S, Lond. & N. W., with Joy valve gear *E News* * Jan 26, *Eng* * June 7-**89**, *The Eng* Dec 21, 21-**88**
WOOLFE 4-cyl. double-expan., ed. (full) *R Gaz* * Mar 8, 8 -**89**
WORSDELL, N. E. R. express, inset *Eng* * Mar 30 * Apr 13-**88**; Worsdell & Borries' system, goods, Prussian State R's, inset * Feb 1; N. E. R. express, inset * June 21, 21-**89**, do. *R & Eng* * May -**90**; applic. to Am. type of locom. *R Gaz* * Dec 14-**88**; Grand Trunk R. * Nov 6-**91**; Bengal R. *The Eng* July 20-**88**
WRIGHT'S *R Gaz* * Jan 30-**91**
COMPRESSED air, 40 and 50 ton, Mekarski system, for Paris, France *E News* * May 31-**90**. See also STREET railroads, compressed air motors
CONNECTING rods, side rods, N. W. R. Club discuss. *R Gaz* Nov 21-**90**; and crank pins, Chic. B. & Q. R. * Jan 16-**91**; parallel rod resistance, Apr 8-**92**; *The Eng* May 25, June 22-**88**

Locomotives, COUNTERBALANCING, recip. parts, Lanza *Am M E* * v 10-**89**; W. H. Lewis *E News* * Apr 26-**90**; eds. *R & Eng* * Feb - Apr -**90**; Hill *Inst C E* * v 104 -**91**; Lanza *R Gaz* * Oct 19-**88**; Booth, cor. * Oct 11-**89**; in 3-cyl. compound, cor. and ed. * Mar 21, review of, 21, Booth, cor. and ed., Apr 4; W. H. Lewis * 25; Western R. club discuss. May 30-**90**, Barr discuss. do. * Mar 6-**91**; expts. on methods, Lanza *Tech Q* * Feb-**89**

CRANK-pin turning machine, Urquhart *Eng* * Apr 12: at Paris exhib. * Sep 27-**89**

CRANK shaft, expts. with, Ivatt *R & Eng* * July -**91**, steel, test of, do. *The Eng* * Apr 3-**91**

CYLINDER cock, Riggin's combination *R Gaz* * July 4-**90**

CYLINDERS, design, Barker, inset *Inst C E* * v 106 -**91**; steam action in at high speeds, ed. *R Gaz* Nov 22-**89**; proper capacity for pushers on grades, ed. * Dec 19-**90**; means for increasing power at speed, ed. Oct 23-**91**; and slide valves, Lond. Br. & So. C. *The Eng* Aug 23-**89**

DELAWARE, Lack. & W. mogul frt. *R Gaz* * Feb 3-**88**

DOUBLE end saddle tank, Porter *R Gaz* * June 14-**89**

DOWNWARD draft, Complete Combustion Co. *E News* * Aug 2 -**90**

DRIVING-box linings, opinions, table *R Gaz* Mar 28-**90**

DRIVING-wheels, 'imperceptible slip,' Sargeant, C. B. & Q., tests of, table *E News* June 14; ap. for removing paint from, Horton * Oct 11-**90**; Vauclain's centers, com. report *F Inst* * July -**91**; big *R & Eng* Nov -**92**; size of express, ed. *R Gaz* Oct 26-**88**; 7½-ft. cast steel, N. E. R., England * Mar 7-**90**; Vauclain's wrt. iron centers * July 10-**91**; best size of, Greenhill *The Eng* Mar 29-**89**; polygonal * Apr 4-**90**

DRIVING-wheel tires, Bess. steel, Arnold *Eng* Dec 7-**88**; wear of, cyl. wheels and flat-topped rails, Whittemore *E News* * Feb 9, and ed. 16, 16, 23, ed. Mar 2; tests, Mich. Cen. * May 11-**89**; retaining ring for * July 19; hollow, dangers of in contact with frog points, Perry * 26; breakages in Germany, Aug 9; steel, and attaching do. with different fastenings, Rhodes, Nov 8 * Dec 6-**90**; irreg. wear of, Barr * Feb 7-**91**, do., Herr * June 16-**92**

Inst C E and rails wear on curves, Helmholtz, abs. v 93-**88**; Bess. steel, influence of chem. composition on strength, Arnold. discuss. * v 95 -**89**; oil-gas tire setting ap., G. T. R., Wanklyn.

Locomotives, DRIVING-wheel tires
abs. v 104 -**91**; and axle specs., English *R & Eng* * Aug; German fastenings * Aug -**91**
R Gaz wear of, table, Master Mech's com. rep. June 22-**88**; steel, influ. chem. compos. on strength, Arnold, Mar 8-**89**; steel and Ross-Meehan shoe, N. E. R. club discuss. Oct 17; steel, attaching to center, Rhodes, Nov 7, fastenings, do. * Dec 5-**90**; irreg. wear of, Barr * Feb 6; wear, flat spots on * Mar 20; steel, tests, Roussel * Apr 3-**91**; stresses in, cor. Jan 22; irreg. wear of, Barr * June 17; shrinkage of, table, July 15; wear, Herr, discuss. * Oct 21-**92**
EASTERN R. of France, tank, Paris exhib., inset *Eng* * Aug 30 * Sep 20-**89**; Flaman boiler (compound), inset * Mar 25 * Apr 8, 22; fast *R & Eng* * Mar -**92**; express experimental *The Eng* * Nov 13-**91**; double-boiler express, inset * Mar 4, 11 -**92**
ELECTRIC, Manhattan Elevated R., and steam, comparative tests, Moss, insets *Am C E* * v 23-**90**; A. Siemens *El Rev Lond* * Aug 12, do. results, City & So. Lond. R. *Eng* * Aug 19, do. *E & Min* * Sep 3-**92**; and steam, compar. tests, effic., Moss *E Rec* July 19, do. *The Eng* Aug 29, do. and ed. (full) *R Gaz* * July 11, Moss, cor. 18-**90**; Weem's high speed, expts., Crosby (full) Mar 13-**91**; as substitutes for steam locoms., Woods, June 24-**92**; Daft, trial, N. Y. El. R. *Sc Am Sup* * Mar 2-**89**
ENGINE drivers, hours of *Eng* Jan 30-**91**
ENGLISH, and Am. and ed. *E News* Aug 2, 2, discuss. Oct 11-**90**; use of truck on *R & Eng* * Aug; express, Paris exhib. * Nov -**89** *The Eng*. See also LOCOMS., Am. and English — erecting
ERECTING *Eng* * Dec 18-**91**; English *R Gaz* * Sep 28; at Altoona *The Eng* Sep 28-**88**
ESTRADE'S high-speed, Paris *Sc Am Sup* * Apr 28 *The Eng* Mar 9, 9-**88**
EXHAUST, nozzle, Macallan's variable *Eng* * Aug 22-**90**; muffler. Penn. R. *E News* * July 21-**88**; pipe, Smith's triple-expan. Mar 16-**89**; pipes, nozzles, etc., Am. R. Master Mech's report * June 20-**91**; nozzles, single and double, ed. *R Gaz* * May 16 -**90**; pipes report * June 19; nozzle, Mertsheimer's variable * July 31-**91**; ap., common sense about, ed. * June 17-**92**
FAIRLIE system, Mex. Cen., inset *Eng* * Mar 14-**90**

Locomotives, FEED water heater and purifier, Barnes' *E News* * Aug 9 *R Gaz* * July 25-**90**; purification, Northwest R. club discuss., C. N. Hunt, Dec 13, 20-**89**

FIRE-boxes, brick arches in, Am. R. Master Mech's com. report *E News* Aug 9-**90.** See also LOCOMS., boilers, fire-boxes

FIRE extinguisher, Penn. R. *R Gaz* * July 19-**89**

FREIGHT, hauling capacities, table *R Gaz* Nov 21-**90**

FRENCH, Paris exhib. *R & Eng* * Nov, pass. * Dec -**89**; tank * Feb -**90** *Eng*; notes *R Gaz* * Jan 16, 23-**91**; Chemin de fer d l'Ouest, express *The Eng* * Oct 4, 11-**89.** See also LOCOMS., Eastern R. of France

FUEL, premiums, Russia, Borodine *R Gaz* Sep 27-**89**; Yates' mileage card, Aug 1-**90**; petroleum, liquid fuel on *Eng* * Oct 19-**88,** working of, Urquhart * Feb 8, 15-**89,** do. tests *E News* * Feb 2-**89,** burning * Aug 25-**92,** do. Dudley *F Inst* * Aug -**88,** in So. E. Russia, Grazi & Tsaritsin R., Urquhart, discuss., insets *Inst M E* * Jan -**89** *R & Eng* * Jan -**89,** on Great Eastern R., England, Booth *R Gaz* * Feb 26-**92** *Sc Am Sup* * Nov 24-**88,** working with, Urquhart (full) * Sep 27 * Oct 4-**90.** See also LOCOMS., boilers, liquid fuel

FURNACE coal burning, Higginson *R Gaz* * Nov 23-**88.** See also LOCOMS., boilers, fire-boxes

GEORGIA Pac., 10-wheel *E News* * Apr 5-**90**

GLASGOW & So. West., pass., inset *The Eng* * Mar 1, 22 -**89**

GRAND Central R., Belgium, tank, inset *Eng* * Aug 16-**89**

GRAND Trunk of Canada, express, inset *Eng* * Dec 14, 21-**88** *Sc Am Sup* * Feb 16-**89**

GRANT works, Chic. *R Gaz* * May 15-**91,** Cicero, Ill., inset * June 17-**92**

GRAZI-Tsaritsin R., So. E. Russia, 8-wheel *The Eng* * Sep 4, 11, 11-**91**

GREAT Britain and Ireland, number *The Eng* Sep 2-**92**

GREAT Eastern R., England, express, inset *Eng* * May 4-**88,** inset * May 27-**92,** *The Eng* * June 12-**91**

GREAT Northern R., England, express *The Eng* June 8-**88** * Nov 6-**91,** insets * Dec 16, 16-**92**; of Scotland, pass., inset *Eng* * May 23-**90**

GREAT Western, England, broad and narrow gauge convertible, inset *Eng* * July 8-**92**; works, Swindon *The Eng* Nov 16-**88**; early * May 20, 27-**92**

Locomotives, HEADLIGHT, elec., Pyle's *El Wld* * Sep 27-**90,** abs. *Inst C E* v 103 -**91**; elec. *R Gaz* Nov 29-**89,** Jan 17-**90**
HIGHLAND R., Scot., standard pass., inset *Eng* * Oct 9 *R & Eng* * Dec -**91**
HISTORY, the DeWitt Clinton, G. H. Thomson, inset *Am C E* * v 23-**90**; old, the 'Sampson,' Robb *Am M E* v 10 -**89**; early, see H. Allen, v 11 -**90**; early, the steam buggy *E News* * Sep 8-**88**; early, Horatio Allen * Jan 11; the John Bull * 18; hist. of development, ed. 18-**90**; Tomlinson, Pres. addr., insets, (full) *Inst M E* * May -**90**
R & Eng * Feb - Apr -**90**; Camden & Amboy R., Norris, n * Jan -**92**; hist. of articulated, Brunner *R Gaz* Sep 25-**91** *Zeit Deut Eisenbahn;* early, Am. type and equalizing lever, Eastwick *R Gaz* * Apr 22, 29-**92**; the rail, spike and locom., Watkins *Sc Am Sup* Dec 12-**91** *The Eng* * Mar 7-**90**
HOELLENTHAL R., inset *Eng* * Feb 6-**91**
HOIST, Chic. & No. W. *R Gaz* * Feb 5-**92**
HUNGARIAN State R's, tank *The Eng* Feb 3, 10-**88**
ILLINOIS Cen. suburban, tests (full) *R Gaz* * June 17-**92**
INDIA, Sind Pishin section, Indian State R's *Eng* Apr 13 * 20-**88,** inset * Apr 19-**89,** 6-coupled, meter gauge *The Eng* Mar 23-**88**; Indian Midland tank * Nov 22-**89**
INDICATOR diags. at high speeds *E News* * June 9, compound and ordinary, comparison * July 7-**92**; indicating. Lyne, *R Gaz* * Aug 2, Manning, cor. 16-**89,** do. Dean * Feb 28; indicator cock, 4-way, Gifford * Mar 7; diags., Worsdell's high speed compound * Mar 28, No. E. R., England and ed. (and train resistance) 28-**90**
IRON Range & Huron Bay heavy frt. *E News* * June 16, 12-wheel, inset * July 7-**92**
ITALIAN pass. *R & Eng* * June -**90**; Ital. Med. R. *The Eng* Nov 9-**88,** pass. * Feb 1 * Mar 29, goods, Sep 6 * Dec 20-**89,** Paris exhib. * Feb 21-**90**
JAPAN Imperial R's tank, inset *Eng* * Feb 10-**88**
LAKE Shore & Mich. So. express, Brooks works (details), inset (full) *R Gaz* * Nov 16-**88**
LANCASHIRE & Yorkshire, England, pass., inset *E News* * Mar 28; 6-wheel frt. *R Gaz* * Jan 30; tender water-scoop * Dec 25-**91**; standard goods, inset *The Eng* * Jan 1-**92**
LONDON, Brighton & So. Coast pass. *R & Eng* Sep, express pass., Paris exhib. *The Eng* July 19, 19-**89**

Locomotives, LONDON & No. W., Crampton engine, 1847, inset *The Eng* * Nov 28-**90**; compound express * Nov 20-**91**
LONDON & So. W. works *The Eng* Sep 28-**88**; tank, inset * Feb 5-**92**
LONDON, Tilbury & So. tank *The Eng* * Nov 25-**92**
MANHATTAN Elevated R., N. Y. n *R & Eng* * Jan -**90**
MEDITERRANEAN R. *The Eng* * Mar 13-**91**
METROPOLITAN R., Lond., 4-wheel tank, inset *Eng* * Dec 18-**91**; Met. Dist. R. pass. tank *E News* * Mar 22-**90**, inset *The Eng* * May 17-**89**
MEXICAN Cen. (Fairlie system), inset *Eng* * May 14-**90**; average econ., Johnstone, cor. *R Gaz* Nov 20-**91**
MICHIGAN Cen. 10-wheel express *R Gaz* * Feb 24-**88**
MIDLAND R., England, express, inset *Eng* * Mar 2, 16-**88**, exp. pass., Paris exhib. *The Eng* Sep 20-**89**
MINERAL tank, Barry R. *Eng* * Dec 2-**92**
MOUNTAIN, two rack-rail, Abt system, Brunig R. and Riggenbach system, Brazil *E News* * Nov 9-**89**. See also RAILROADS, mountain
NARROW gauge frt., for So. Am. (meter gauge), Sharp Stewart, Glasgow *E News* * May 17; compound, Baldwin * Dec 13 -**90**
NEWPORT News & Miss. Val. 10-wheel frt. *R Gaz* * Mar 16-**88**
NEW So. Wales Gov't. R's, Baldwin 10-wheel *R Gaz* * May 29-**91** *The Eng* Nov 23-**88** (full), July 1, Oct 14-**92**
NEW York Cen. & H. R. 19 x 26 Brooks mogul, inset *R Gaz* * July 25-**90**; suburban, inset * Sep 11-**91**
NEW York, L. Erie & W. express, inset *R Gaz* * Jan 6-**88**
NEW York & Northern, Rogers works, suburban service, n *R & Eng* * Oct -**88**
NEW Zeal. Gov't. R's tank, inset *Eng* Jan 29-**92**, do. for heavy grades, inset *E News* * Nov 14-**91**
NORTH Land. R. tank goods, inset *Eng* * Oct 3-**90**, pass., inset * Jan 9-**91**
NORTHERN Pac. consolidation, inset *Eng* * Oct 25, *Sc Am Sup* * Dec 7-**89**
OLD Colony R., simple and compound, tests, tables *R Gaz* Sep 16-**92**; pass., inset *The Eng* * Nov 14-**90**
OSCILLATIONS ap., West. R. of France *Eng* * Jan 10; registering ap. *E News* * Feb 8-**90**
PENN. R. pass. *The Eng* * Oct 17, 17-**90**

Locomotives, PHILADELPHIA & Reading heavy consol. *R Gaz* * Jan 4-**89**; express * Apr 15-**92**
PIECE-work classification (full) *R & Eng* Jan – Mar -**92**
PISTON, rod breakages, report *R & Eng* * Nov; Am. balance piston *R Gaz* * Jan 3-**90**
PRUSSIAN *R Gaz* July 11-**90**
RACK rail. See LOCOMS., mt; RAILROADS, mt.
RAUB, the, n *The Eng* Dec 7-**88**
RESISTANCE, engine and ed. *E News* Jan 5, 5-**89**
REVERSE lever, Cumb. & Pa. R. *R Gaz* * May 23-**90**
RICHMOND works *R & Eng* * Oct -**90**
RUSSIAN heavy frt. *R & Eng* * Sep -**92**
ST. Clair tunnel decapod tank frt., inset *R Gaz* * Apr 3, 10-wheel *The Eng* * Apr 24 * May 29-**91**
ST. Gall & Garis mt. road R., Switz., inset *Eng* * Dec 30, 30-**92**
SANDING ap., steam *Eng* * June 29, do. *R & Eng* * Aug, do. *R Gaz* * Sep 14-**88**; Leach's sand feeding ap. *E News* * Feb 13-**92**
SAXON State R., 4-cyl. compound *The Eng* * Oct 23-**91**
SCHENECTADY works *R Gaz* * July 15-**92**
SHAY, the, Gilpin Tramway, Col. *E News* * Apr 26-**90**, inset *R Gaz* May 8-**91**
SLIDE valves, friction of, Aspinall, discuss., insets *Inst C E* * v 95 -**89** *The Eng* Dec 28-**88**; and cyls., Lond. Br. & So. C. R. Aug 23-**89**
SMOKE-stacks, and exhaust nozzles design, W. H. Lewis *E News* * June 23-**92**; cast iron *R Gaz* * Apr 18-**90**; Manhat. eleva. R. * Mar 4-**92**; straight, theory of, Snow *Sc Am Sup* * Apr 13-**89** *Am Mas Mech*
SOUTH Eastern R., England, express pass., Paris exhib., inset *Eng* * Apr 25 * May 2 *E News* * Feb 22-**90**, inset *The Eng* * Nov 29 * Dec 13-**89** * Jan 3-**90**
SOUTHERN R., Italy, goods, inset *Eng* * Oct 31-**90**
SOUTHERN Pac. R., 8-wheel, diag. *E News* * Apr 25-**91**
SPARK arresters, Bell's *R & Eng* * Mar; Brown's and smoke stack *R Gaz* * Nov 14-**90**
SPRINGS and equalizers, Master Mech's com. report *R Gaz* * June 29-**88**
STRONG, the, distrib. of steam in, Dean *Am M E* * v 9-**88**, sup. v 10-**89**; inset *Eng* * May 17, 17, cor. June 7-**89**; Strong Manuf. works * June 6-**90**; remarkable run *E News* Apr 6-

Locomotives, STRONG
89 *F Inst* * Feb -**88**; steam distrib., Dean *R Gaz* May 25-**88**; the 'A. G. Darwin,' inset * Jan 11; indic. diags. June 28 * July 26-**89** *Sci Am* Jan 12-**89**; insets * *Soc Arts Mass* -**88**; Tratman *The Eng* Sep 13-**89**
SWEDISH pass. *R & Eng* * May -**88**
SWINERTON polygonal driving-wheel *E News* May 24, Swinerton, cor. June 28-**90**
TAFF Vale R. 10-wheel tank pass., inset *Eng* * Aug 2, 9-**89**
TENDERS, Wabash R. *E News* * Dec 1-**92**; truck, U. P. standard *R Gaz* * Dec 7-**88**; axles, muck-bar, tests, Watertown arsenal, Howard (full) Jan 4; trucks, Hickey, Feb 22, Mar 1-**89**; iron frame, N. Y. L. Erie & W. * Apr 18; heavy axles, Master Mech's com. report * June 20; iron frame, Brooks works * Nov 7-**90**; hopper, Wabash R. * Nov 18-**92**
TESTS, and elec. motor, comparative tests, Manhat. El. R., Moss, insets *Am C E* * v 23-**90**; standard method, prelim. report *Am M E* * v 13; experimental, Goss * v 13-**92**, do. *E News* * May 19, 19-**92**; Penn. R. n Apr 26-**90**; expts., Donkin *Eng* * Oct 21-**92**
R Gaz trials, Manning * July 12, 19; in Chili, Stillman, Dec 27-**89**; standard method, Dean * June 20, 27; testing, Manning, July 18; the calorimeter in testing, Barrus * Oct 17-**90**; Baldwin 10-wheel, B. & O., ed. (full) * Nov 27, 27 * Dec 11-**91**
R Gaz Old Colony, table, May 27; standard, com. report (full) 27; Ill. Cen. suburban (full) * June 17; simple and compound, O. Col., tables, Sep 16; Schenec. prelim. Oct 7-**92**; Am. performance, n *The Eng* Apr 20-**88**; trials, Chili, Feb 14 -**90**; experimental, Goss * June 3-**92**. See also LOCOMS., compound; RAILROADS, speed
TIRE testing machine, Chapelle works, Paris *The Eng* Jan 6 -**88**
TRACK tanks, Balt. & O. R., Andrews *R Gaz* Oct 28-**92**
TRACTION, tractive power, diag. *E News* * Sep 7-**89**; the Ries traction increaser * Aug 9-**90**, ed. * May 9-**91**; tractive power, n *R & Eng* * Sep -**89**; how does it pull itself * Apr -**92**; tractive force and train resistance *R Gaz* * Oct 24-**90**, do. Slack *Steven's Indic* July 15-**88**; and driving, the mechanics of, R. H. Smith (full) *The Eng* * May 13 * June 3-**92**
TRALEE & Dingle R. narrow gauge *The Eng* * July 15-**92**
VALVE, Child's cyl. *R & Eng* * Jan -**89** * May -**92**

Locomotives, VALVE gears, Bonnefond's *Eng* * Dec 20-**89,** do. *R Gaz* * Jan 17; Hunt's pat. *R & Eng* * June -**90**; Rickie's, Cawnpore st. R's, India *The Eng* July 6-**88**
WABASH 10-wheel express, inset *R Gaz* * Oct 17-**90**
WATERFORD & Limerick R. *The Eng* * Sep 12-**90**
WEIGHING machine, Paris & Orleans R. *Eng* * Nov 29-**89**
WESTERN R. of France, Paris exhib. *Eng* * Oct 18; tank * Nov 22-**89**; pass., inset * June 6, 13-**90**
WOOTTEN, the, com. report *F Inst* * Sep -**91**; U. P. express pass. (boiler) *R Gaz* * June 15, details * Oct 5 *The Eng* July 6 -**88**
Lock, Havre transatlantic, iron gates, Widmer, abs. *Inst C E* v 92 -**88** *An Ponts* * v 14 -**87.** See also CANALS, locks
Lock-nut, the Cluther *The Eng* Sep 28-**88.** See also TRACK, lock-nuts
Locks, elec. applic. to, Kintner *El Eng* * Jan -**88**
Lockwood, John, n *Am C E* v 27-**92**
Lockwood, Thomas D., por. *El Wld* * Sep 14-**89**
Lodge, Oliver J., por. *El Wld* * May 9-**91,** por. *Sc Am Sup* * Nov 1-**90**
Logarithms *Pwr* Jan -**92**
Logger, steam *Sc Am Sup* * Apr 14-**88**
Logs, loading on cars, M. C. B. standard *E News* * Nov 1-**90**; new proc. for comput. of, May 5-**92**
Logwood, extracts testing, Palmer *F Inst* Apr -**89**; extractive matter of, Macfarlane, Mar -**90**
London, elec. lighting of, ed. *Eng* May 24-**89**; growth, *E News* Aug 15-**85**; July 22-**88**; water Co's remarkable hist. Aug. 17-**89**; street traffic, July 5; smoke, value of, n Dec 6-**90**; traffic, Howe report sup. Jan 2; Met. Gov't., ed. Apr 21; rapid transit * Nov 24-**92,** do., Reckenzaun *St R J* May -**91**; main drainage report *The Eng* Mar 13-**91**; new streets between Holborn and Strand, proposed, map * July 15-**92.** See also HYDRAULIC power distrib., Lond; PAVEMENTS; RAILROADS, underground; SEWERS; WATER-works, etc.
Loring, Charles A., por. *Cassier's* * Dec -**91**
Louisiana quarantine system, Holt *Sc Am Sup* * Jan 7 * Feb 4 -**88**
Loveridge, Henry, por. *E & Min* * Dec 13-**90**
Low, Thomas B. *Inst C E* v 91 -**88**
Lubbock, John, por. *Sc Am Sup* * Mar 22-**90**

Lubrication, viscosity, dets. of, Denton *Am M E* v 9 -**88,** measurement of durability of lubricants, do. * v 11 -**90,** expts. with, do., Bissell, v 12 -**91,** self-lubricating fibre graphite for machinery bearings, Cooper, v 13-**92**; friction of, Thurston *Cassier's* Oct -**92**; J. V. Wilson *Eng* * Apr 20-**88**; anti-friction materials, Hedges, Aug 26-**92**; dry lubricants *E & Min* Aug 24-**89**; lubricating oil purifier *E News* * June 21-**90**; the Holmes lubricant bearing, com. report *F Inst* Dec -**91**; measurement of durabil., Denton *Pwr* * June; lub. oils exam., Stillman, Sep -**90** *Steven's Indic;* durabil. of lubricants, Denton *R Gaz* May 23-**90**; rationale of, Snowden, Feb 13-**91**; Barr, Dec 2-**92**; lub. oils, Charlier *Sc Am Sup* Nov 29 *The Eng* Oct 17-**90**; oils, ed. Sep 18-**91.** See also BEARINGS without lubs; FRICTION and lub; GREASE; OILS

Luiz, Dom I (King of Portugal) *Inst C E* v 100 -**90**

Lumber, creosote, Fernandina works, Fla. *R Gaz* * Nov 16-**88**; No. western traffic, Mar 25-**92**; cutting, circular saw or band, n *Sc Am Sup* * Oct 25-**90.** See also WOOD

Lunkenheimer, Frederick, por. *Cassier's* * Jan -**92**

Lunn, Robert W. *Inst C E* v 100 -**90**

Lyons, John *Inst C E* v 101 -**90**

Machine, moulding, Tabor *Am M E* * v 13 -**92** *Cassier's* * July; design, æsthetics in, Barr, Aug -**92**; design, Unwin, bk. review *Eng* Apr 24-**91**; designing, intuition in, Hawkins *E Mag* July -**92,** do. *The Eng* Feb 15, 22-**89**; designing, Sweet *F Inst* * Apr, do. *R Gaz* * June 15, do. *Sc Am Sup* * Apr 28 * May 5-**88**; accident preventing devices, Cooper *Pwr* * Dec -**90** *Am M E* v 12-**91**; construction, Richards, bk. review *R & Eng* Nov -**89**

SHOPS, Austrian regulations for *E News* May 31; slow burning construct., Boston Manuf's Mut. Fire Ins. Co. * July 26-**90**; with weaving shed roof, Sweet * Dec 15 *Am M E* * v 13-**92**; France *R Gaz* May 2; framing, Wilmerding, Pa., Westinghouse * Apr 11, June 6-**90**; Link Belt Machine Co. * Apr 24 -**91**

STOKING, Spencer, discuss., insets *Inst C E* * v 104-**91.** See also STOKERS, mechan.

TOOLS, mod., Dixon *Eng* Feb 3 *The Eng* Jan 20-**88**; power used by, n *E News* July 19-**90**; indic. diags. from, Breckenridge *Lehigh Eng J* Oct -**88.** See also Shipyard machine tools, etc.

Machinery, The Mechanics of, Kennedy, bk; tight set-screws in, Cooper, discuss. *Am M E* -**88**; miscel., Roy. Agric. Show, Nottingham *The Eng* July 20; use of in construction, Price, Oct 26; sale of old, Sharp, Stewart & Co. 26-**88**; old, sale prices, July 19-**89**

Machines, accident preventing devices applied to, Cooper *Am M E* v 12 -**91** *Pwr* * Dec -**90**. See also AUTOMATIC—SLOT machines

Mackensie, John *Inst C E* v 106 -**91**

Mackintosh, Alexander *Inst C E* v 101 -**90**

Macnab, Alexander *Inst C E* v 104 -**91**

Macy, Arthur, por. *E & Min* * May 9-**91**

Magheramorne, Lord *Inst C E* v 101 -**90**

Magic lantern, optical projection, Wright, bk. review *Eng* Dec 4 *The Eng* * Nov 13 * Dec 25-**91**

Magnesite as a refractory material, Sorge *E & Min* Jan 16 -**88**

Magnetic, circuits and measurements, Du Bois *El Rev Lond* * Oct 9; induction, molecular proc. in, Ewing (full) *Sc Am Sup* * Nov 14; reluctance, Kennelly (full) *El Wld* * Nov 7, discuss. 21, (full) *El Rev* * Nov 7-**91**; fields, graphic representations, Houston * Sep 3-**92**. See also ELEC. magnetic

SEPARATORS *E & Min* * Nov 5-**92**; Paris exhib., Hering *F Inst* * June; Hall, cor. *The Eng* * July 18-**90**

BALL & Norton electro-, Ball *Am Min* * v 19-**91** *El Eng* * Oct 8, Monarch *El Rev* * Oct 11-**90**

BUCHANAN'S ore *E & Min* * Mar 10-**83** * June 15-**89**

CHASE iron ore *E & Min* * July 2 *E News* * Sep 1-**92**

EDISON'S, n *E & Min* * Dec 8-**88** *Sc Am Sup* * Jan 12-**89**

HOFFMAN *E & Min* * Dec 12-**91**

LOVETT-Finney iron ore *E & Min* * Nov 21-**91**

MONARCH ore *El Rev* * Oct 11, Ball *El Wld* * 11 *E & Min* * Sep 6, Ball *The Eng* * Dec 5-**90**

VENSTROM *E & Min* * Nov 24-**88**

WENSTROM, Cook *Am Min* * v 17 -**89**. See also IRON ore concen., Birkinbine * v 17 — mag. separators

Magnetism, relation to induced elec. mo. force and cur. E. Thomson *El Rev Lond* * June 21-**89**; Hopkinson * Jan 17, 31-**90**; and recalescence, do. *El Wld* * Dec 20-**90**; Ewing's theory of, Crew *F Inst* * Aug, Hoopes *El Wld* * May 16; elec., galvanism and the telegraph, chronol. hist., Mottelay (very

Magnetism

full) * Apr 18-**91** – Feb 27, Sep 3, pors. 10 – * Oct 22 – Dec 31 -**92**, etc.

Sc Am Sup influence upon crystallization, Decharme * Mar 31; protection of watches against, Woodbury, Oct 20-**88**; curiosities, Bidwell (full) * July 6; relation to induced elec. mo. force and cur., E. Thomson (full) * Aug 17-**89**; Hopkinson (full) * Mar 1, 8-**90**; recent prog. in Giles, Dec 26-**91**; wave propagation of, Trowbridge, July 2-**92**; Hopkinson *The Eng* * Mar 7-**90**. See also ELEC. magnetism

Magnetite, crystalline, in Port Henry, N. Y. mines, Birkinbine *Am Min* * v 18-**90**; Ontaria, Ledyard, discuss. v 20, So. W. Va., Nitze, v 20 -**92**; concentrating with Conkling jig at Lyon Mt., N. Y., Ruttmann *E & Min* * June 9-**88**

Magnets, permanent, character of steel used for, Preece (full) *El Rev Lond* * Sep 12-**90**, S. P. Thompson *El Rev* Aug 8 *El Wld* * Aug 1, 8, 22-**91**. See also ELEC. magnets—magnetism, etc.

Magnolia metal for machine bearings, R. H. Smith report *The Eng* * Dec 20-**89**

Main, John F. *Inst C E* v 110 -**92**

Malaria, malarious districts, treatment of *Eng* * Mar 2-**88**; Celli *Sc Am Sup* * June 27-**91**

Malt drying vac. stove *Sc Am Sup* * June 30-**88**

Man, evolution in civilized, Powell *Sc Am Sup* Apr 7-**88**; effects on strength of injections from liquid from animals, Brown-Sequard, Aug 10, Brown-Sequard discov., Stockwell, Oct 19-**89**; man's upward struggle, Aaron, Aug 13; cerebro-spinal axis as a thermal center and power, Richardson, Oct 1-**92**. See also MEN

Manganese, manganese-steel, Howe *Am M E* * v 12-**91** *E News* * June 20-**91**; ores, argentiferous, Tombstone dist., Ariz., Goodale (supplementary) * v 18 -**90**; ore deposits, Crimora, Va., Hall *Am Min* * v 20-**92**; steel *El Rev Lond* Aug 10, do. Hadfield *Eng* Mar 9, Sep 7, 21-**88**

E & Min Santiago de Cuba mines, Reimer report, Nov 24-**88**; the Reymert manganiferous lode, Ariz., Blauvelt, Feb 9-**89**; the Crimora mine, Va. * Mar 22-**90**; ores, U. S. produc., Weeks, Cen. bull. May 23; distrib. in No. Am., Penrose, Aug 1 -**91**; metallic, Bullock, n *F Inst* July -**89**; bronze *The Eng* * July 25-**90**

Manual training, education for the workshop, Perrine *E Mag* May; man. training-kindergartens, Plunkett *Pop Sci* July -**92**

Manufactures, time and cost keeping, Binsse *Am M E* v 9 -**88**; manuf'g industries net profits, ed. *Eng* Oct 9; practical prime cost, ed. Dec 4, 11-**91**; in U. S., growth, n *E News* Oct 11; industries stats., ed. *E & Min* Aug 2-**90**; and arts, review of prog. *F Inst* Feb -**88**; English manuf's in U. S., Siddell *The Eng* Nov 14, 21-**90**; Am., recent growth, Nov 25-**92.** See also INDUSTRIAL Co's

Maps, in relief, construct., Harden *Am Min* * v 16-**88**; mercator chart drawing on one sheet, Kelvin *El Rev Lond* * Sep 30-**92**; of ordnance survey, Scot. Highlands *Eng* Jan 6, 20 * Feb 3, 17 * Mar 2, 16, 30 * Apr 13, 27 * May * June 1, 15, 29-**88**; pocket mapping instrum., Lane *E & Min* * Apr 12-**90**

E News plotting contours, Lorimi, diag., cor. * Feb 23; making topog. relief maps, cor. 23-**89**; Gov't., scale of, in Europe, n Dec 19-**91**; topog. lettering and marking ap., n Feb 6-**92**; mapping of the world *R & Eng* June -**91.** See also MINING maps; SURVEYING, topog.

Marble quarrying, U. S., Morse *E Mag* Oct -**91.** See also RAILROADS, Carrara-Marble District

Marillier, James C. *Inst C E* v 102 -**90**

Marine engineering, development and prog. during past 15 years, Seaton *Am Min* v 19 -**91**; *Eng* Nov 14-**90**, Jan 16-**91**; submarine gullies, Webb *El Rev Lond* Feb 24; concrete for marine constructions *Eng* July 20-**88**; some details in, Mudd, Apr 10 *The Eng* * Apr 10; eng. during last decade, Blechynden, July 31, Aug 7, insets (full) *Inst M E* * July *Sc Am Sup* Sep 19, 26 *Eng* July 31 * Aug 21, Sep 18; practice 40 years ago, Denny, June 26-**91**; and ship-building in '92, Dec 23-**92**

E News Brit. and Am., ed. Jan 26-**89**; Vivarttas *R & Eng* July * Aug -**91**; casualties, causes *Sc Am Sup* Aug 13; Capt. of the 'Mary Rose,' Clowes * Sep 17, 24-**92** *The Eng* Glasgow exhib. Aug 10-**88**; and naval architecture at Edinburgh exhib. July 18, Oct 17-**90.** See also BOATS; FERRY-boats; HARBOR eng; LAUNCHES; LIFE-boats; NAVAL eng; NAVIES; SCREW propellers; SHIPS; STEAMBOATS; STEAMERS; TORPEDO boats; YACHTS, etc.

BOILERS, Babcock *Cassier's* * Jan -**92**; working and test pressures, Sennett *Eng* Mar 30 *The Eng* Mar 30-**88**; corrosion, Dodds, May 3 *Eng* Mar 29-**89**; double shell, Casebourne, Jan

Marine BOILERS
3; distrib. of evap. in, Stromeyer, Apr 11; furnaces, Kilvington, June 27-**90**; short, strength of * Apr 17, cor. * May 15-**91**; (navy) ed. Mar 18; failure of, ed. May 20; treatment, W. Wilson, Oct 21, Nov 4, 11-**92**
E Mag mod., Willits * June -**92**; Walters *Pwr* Dec -**89**; tubulous, Leonard *R & Eng* * July * Aug * Nov -**90**, Thwaite * July; high pressure * Mar -**91**; adaptation of steam machin. in marine construction, Emery (full) *Sc Am Sup* Jan 18, 25-**90**
ALFONSO XII str., inset *Eng* * Feb 15 * Mar 1-**89**
ALMY water-tube, Normand's *Cassier's* * Sep *R & Eng* * July -**92**
AUSTRALIA, Am. Pacific str. *The Eng* July 19-**89**
BABCOCK *Cassier's* * Jan -**92**, Babcock & Wilcox water-tube *Eng* * May 22-**91**
BARHAM and Bellona S. S., insets *Eng* * Nov 28 * Dec 12, 12-**90**
CARSON, the, n *R & Eng* * May -**91**
CALORIC str., compound *Eng* * Aug 23-**89**
CITY of Dundee str., inset *The Eng* * Feb 26-**92**
EDGAR, H. M. S. *Eng* * Jan 1-**92**
FEED water heater, Edmiston's *The Eng* * Feb 26-**92**
FORCED draught, Fothergill *Eng* * Apr 6, in navy, 6, Soper, 6, Howden, cor. May 18-**88**; construction adapted to, Yarrow * Mar 20-**91**; ed. *E News* Feb 22-**90**; prevention of leakage around tubes, Yarrow * Apr 11, 18-**91** *Eng*, *The Eng* Howden, Feb 3, 10, cor. Mar 2; on the closed stokehold system, Soper, Apr 6, cor. 13, ed. 20, Fothergill, 6, 6; Fothergill's system, str. Hilda, Nov 2-**88**; construction for, Yarrow * Mar 20-**91**
GRACE Darling steam yacht *The Eng* Mar 23-**88**
INDIA, str. *Eng* * May 1-**91**
KAISER Wilhelm II, inset *Eng* * Aug 1, 15-**90**
LIQUID fuel, oil fuel in *E News* Feb 1-**90**; applic. to, Busley, abs. *Inst C E* v 92 -**88**; furnaces for, do. *R & Eng* * Apr-June -**88**
LYNX str., Great Western R., inset *Eng* * June 13-**90**
MAINE, U. S. cruiser, N. Y. navy yard *R & Eng* * July *The Eng* * Apr 25-**90**
MIRA steam yacht *Eng* * Mar 18-**92**
MODJESKA twin-screw str., inset *Eng* * Oct 4-**89**
OPHIR str., Orient liner, insets *Eng* * Nov 6, 20, 27-**91**

Marine BOILERS, RAMILLIES, H. M. battle-ship *Eng* * Aug 12 -**92**

ROSLIN Castle str. *The Eng* Nov 30, 30-**88**

SCOT str. *Eng* * July 3, 10-**91**

SINOPE, Russian ironclad *Eng* * July 18-**90**

TARTAR str. *The Eng* * May 23-**90**

THORNYCROFT water-tube *Eng* Apr 26-**89**, Dec 23-**92**, discuss., insets (full) *Inst C E* * v 99 -**90**, for warships *Sc Am Sup* * June 8 *The Eng* Nov 22-**89**

U. S., cruiser 12 *R & Eng* * Dec -**90**; cruiser 6 *The Eng* * Nov 6-**91**

WATER-gauge fittings, Gray *Eng* Dec 25-**91**

WATER-tube, trials, Loring, abs. *Inst C E* v 104 -**91** *J Am Soc Naval Engr's* -**90**. See also MARINE boilers, Almy — Babcock — Thornycroft

YORKTOWN, U. S. Cruiser *Eng* * Apr 24-**91**

CABLES, laying, Webb (full) *Sc Am Sup* Apr 19-**90** *El Wld.* See also TELEGRAPH cables

COLLISION apron, the Schultz *E News* Jan 7-**88**; collisions at sea, Barroll (full) *R & Eng* * Sep -**90**

COMPASS, hist., theoretical and practical, Wilson-Barker *El Rev Lond* Apr 8-**92**; the Chase recording and alarm *El Wld* * Jan 18-**90**; mariner's *Locom* Nov -**91**; adjusting at sea *Sc Am Sup* July 26-**90**. See also COMPASS

CONDENSERS, the Yaryan fresh water *Eng* July 26-**89** *Pwr* * Feb-**90**

DISTILLING ap., fresh water *E News* * May 12-**88**

DIVING suit survey, Saunders *E Mag* * July -**91**

ENGINES, triple-expan. *Cassier's* * Dec -**91** * Jan, econ. of * Nov * Dec -**92**; quadruple compound *Eng* * June 1; h. p. of, report, Dec 28-**88**; wt. of, Mar 8; trip-expan. for river str. * Nov 8; 1800 h.p. trip-expan. * Dec 20-**89**; and eng. prog., 15 years, Seaton, Nov 14-**90**, Jan 16-**91** *Am Min* v 19 -**91**; Joy's assistant cyl. for *Eng* * Apr 10; engine room practice, W. Wilson, May 29; Durston, July 31-**91**; steam nav., early hist., Kent *E & Min* Mar 7-**91**; 18,000 h.p. *Locom* May -**89** *The Eng;* trip-expan. on lake strs., Miller *R & Eng* * Jan -**88**; quadruple-expan. * Jan -**90** *Industries*

Sc Am Sup adapt. of steam machin. in marine construction, Emery (full) Jan 18, 25; 15 years' development and eng. prog., Seaton, Oct 25-**90**

Marines ENGINES
The Eng development in Brit. navy, Mar 23, Apr 6, 20, May 4, 18, June 8, July 6, Nov 30; of str. Terrible, 1842, Aug 31, 31; first century of, Dyer, Sep 21, 28-**88**; effic. of, ed. Sep 13-**89**; compound, 60 years ago, str. Hercules * May 16, 16, str. Batavia, * Aug 8, Maasboot * Sep 19, Moselle steamboat * Dec 26-**90** * Jan 23 * Apr 3; ed. Feb 13; Joy's assistant cyl. * Apr 17-**91**; trip-expan. in the mercantile marine, Dalrymple, Feb 19-**92**
AGINCOURT str. *The Eng* May 18, 18-**88**
ALFONSO XII, inset *Eng* * Feb 15 * Mar 1-**89**
ARGUS str. *Eng* * Jan 25-**89**
AUSTRALIA and Galatea valve gear diag. *The Eng* * Mar 29 -**89**
AUXILIARY, on shipboard, W. Allen *Eng* Jan 16, discuss., inset *Inst C E* * v 104 -**91**; str. Violet, inset *The Eng* * Aug 7-**91**
BALANCING and vibrations of vessels *Eng* * Apr 8, inset * 15 *E News* * Apr 28, (full) *R & Eng* * Aug *Sc Am Sup* * June 4, (full) *The Eng* * Apr 8-**92**
BARHAM and Bellona strs., insets *Eng* * Nov 28 * Dec 12, 12 -**90**
BUENOS Ayres str., quadrup-expan., insets *Eng* * Oct 12, 26 -**88**
CANFIELD'S compound *R & Eng* * Aug -**91**
CERAM, Dutch gun-boat *R & Eng* * Mar -**88**
CIRCE str., trip-expan. *The Eng* May 11, 11-**88**
CITY of Dundee str., inset *The Eng* * Feb 26-**92**
CITY of Paris, accident *E News* * May 3-**90**
CITY of Richmond str., indicating, Barrus *Am M E* * v 11-**90**
CITY of Vienna, trip-expan. with Morton's valve gear, inset *Eng* * Apr 3-**91**
CLUTHA ferry str., trip-expan., inset *Eng* * Apr 26-**89**
FALLS of Inversnaid str., inset *Eng* * Nov 23-**88**
FURST Bismarck str., insets *Eng* * Apr 1, 22-**92**
GOVERNORS, Churchill *Eng* Jan 17 *Sc Am Sup* Feb 22-**90**
GRACE Darling steam yacht *The Eng* Mar 23, 23-**88**
INDEFATIGABLE, trip-expan. *Cassier's* * Oct -**92**
IVY str., trip-expan. *R & Eng* * Mar -**90**
KAISER Wilhelm II str., insets *Eng* * Aug 1, 15-**90**
LADY Torfrida steam yacht, trip-expan., inset *Eng* * May 10-**89**
LA Flandre, Belgian Roy. Mail paddle str. *The Eng* * Apr 5 -**89**

Marine ENGINES, LORD of the Isles, oscil., inset *Eng* * July 15-**92**
LYNX str., Great Western R., inset *Eng* * June 13-**90**
MAINE, U. S. cruiser, trip-expan. *Eng* * Feb 10-**88** *R & Eng* * July *The Eng* * Apr 25-**90**
METEOR str., trip-expan., performance, com. report, Kennedy *Eng* * May 10, inset * Sep 13, trials, insets, do. (full) *Inst M E* * May -**89**
MINHO str., inset *The Eng* * Aug 21-**91**
MIRA steam yacht *Eng* * Mar 18-**92**
MODJESKA twin screw str., inset *Eng* * Oct 4-**89**
MOSELLE steamboat, compound, 1840 *The Eng* * Dec 26-**90**
NAIAD, English cruiser *R & Eng* * Feb -**92** *Industries*
NEW York, cruiser, inset *Eng* * May 6-**92**
NILE pass. str., paddle, trip-expan. *The Eng* * Feb 13-**91**
OPHIR str., Orient liner, insets *Eng* * Nov 6, 20, 27-**91**
PARIS str., compound side-wheel *R & Eng* * May -**89** *The Eng*
PURITAN, Fall River line *Eng* * Jan 16, 23-**91**
QUEEN'S Is., and ship-building works *The Eng* Aug 17-**88**
RE Umberto, 20,000 h.p. compound, Ital. twin-screw war str. *The Eng* July 6-**88**
SALAMANDER, Aurora *The Eng* July 27, 27-**88**
SCOT str., twin-screw, So. Africa Roy. Mail, inset *Eng* * July 3, 10, Union S. S. Co., inset *The Eng* * July 10-**91**
SHAFTS, crank and screw, of the mercantile marine, Mannel *Sc Am Sup* * Sep 28-**89**
SINOPE, Russian ironclad, inset *Eng* * July 18-**90**
SIRIO, Orione and Persio trip-expan. *R & Eng* * June *Steamship*, *The Eng* * Apr 10, diags., inset * May 29-**91**
TRIALS, Inst. M. E. com. report *Eng* May 10-**89**; Kennedy, May 9, 9, 16 * 23-**90**, report * May 8, 8; experimental, Walker eng. lab., Liverpool, Hele-Shaw, Aug 7, discuss., insets *Inst M E* * July *The Eng* * Sep 4-**91**; Ville de Douvres, com. report, Kennedy, insets (full) *Inst M E* * May *Eng* * May 13, 20; three cruisers, Liversidge * 20-**92**; str. Fusi Yama, Kennedy report *The Eng* May 2, 9, Colchester, Tartar, com. report, insets (full) *Inst M E* * May -**90**; str. Iona, Kennedy, insets (full) * Apr -**91**; com. report (full) May -**92**; test at sea *R Gaz* * June 14; tests in actual service. com. report, Dec 6-**89** *Inst M E*
U. S. battleships *R & Eng* * Sep: cruiser No. 6, surface condensers *The Eng* * Sep 25, trip-expan., inset * Oct 2-**91**

Marine ENGINES, VALVE gear, Morton's *Sc Am Sup* * Sep 8-**88**
VAUBAN str., trip-expan. *The Eng* * June 13-**90**
VIOLET str. trip-expan., Lond. & No. W. R., inset *The Eng* * Apr 17, 17 * May 1-**91**
WAI str., inset *Eng* * Aug 21-**91**
WARRIOR str., trunk engines *The Eng* * May 4, 4-**88**
ZARIA, steam yacht, trip-expan. *The Eng* * Mar 25-**92**
GUN steady platform, Tower's *Sc Am Sup* * Jan 10-**91** *The Eng* * Apr 19-**89.** See also MARINE range-finder
LOCOMOTIVE, Huet's ocean *Sc Am Sup* * June 21-**90**; Midland R. works, Derby *The Eng* Aug 10-**88**
MESSAGERIES Maritimes, report *Eng* June 29-**88,** ed. July 19-**89,** July 18-**90**
RANGE and position finder, Fiske's *El Eng* * Oct 1 *El Rev Lond* * Feb 21 * Apr 11-**90,** direct reading * Jan 2-**91** *El Wld* * Feb 8, position indicator * Mar 8-**90,** elec. *F Inst* * Oct -**92** *Eng, Sc Am Sup* * June 6; ap., taking distances at sea * Mar 14; Anderson's *El Wld* * Aug 22-**91**
ROUTES, steam lanes across the Atlantic, Barroll *R & Eng* * Oct -**90**
SHEERS, 80-ton hydr., West Hartlepool *Eng* * Mar 25-**92.** See also SHEARS
SIGNALS, sound signals at sea, A. Johnson *Pop Sci* May; types of *Sc Am Sup* * Oct 6-**88**
SPEEDS, Admiralty coeffs. formulas, Mansel *The Eng* May 30-**90**
STEERING gear, Harfield's compensating *The Eng* * Dec 25-**91**
WATER evaporators, Quiggin's *The Eng* * Oct 10-**90**
Mariner's compass *Locom* Nov -**91.** See also COMPASS
Maritime, Wash. conference, Colomb. *Eng* * Mar 28, Apr 4-**90**
Market, Buenos Ayres produce *The Eng* * June 5-**91**
Markham, Charles *Inst C E* v 95 -**89**
Marley, John *Inst C E* v 105 -**91**
Mars, Ball *Littell's* Oct 22-**92** *Fortnightly Rev.* See also ASTRON., Mars
Martin, Henry R. H. *Inst C E* v 91 -**88**
Mascart, E. E. N., por. *El Wld* * Sep 28-**89**
Masonry, construction, cost in detail *E News* Dec 8-**88**; indicator for detecting movements in, Abbott * Dec 19-**91**; construction, Baker, bk. review *R & Eng* Nov -**89.** See also BRICK; CEMENTS, compressive strength and settlement of masonry

Mass, and motion, Mott *Sc Am Sup* Mar 15-**90**; and wt., n. Greenhall, cor. *The Eng* May 3, Lousley, cor. 10-**89**

Massachusetts, sewage disposal, Stearns *Am C E* v 18 -**88**; constitution, who made, Atkinson *Tech Q* Dec -**88**

Mass. Inst. of Tech., eng. laboratories, notes on, Lanza *Inst C E* * v **91** -**88**; eng. building, Lanza, inset, hydr. lab., Swain, heating and ventil., Woodbridge * *Soc Arts Mass* -**90**; beginning, Munroe *Tech Q* May -**88**; commemorative addresses, Lowell, Aug; hydr. lab., Swain, Aug; changes, Walker, Nov -**90**; English admission exam., Carpenter, July -**91**; triple engine tests, Peabody, Miller * Oct -**92**. See also SCHOOLS

Materials, of Construction, the Testing of, Unwin, bk., Longman's, Lond. '88; Compression Resistance of Freestone, Brick Piers, Hydr. Cements, Mortars and Concretes, bk., Wiley, N. Y. '88 *F Inst* Sep -**88**; strength, stresses det. by method of least work, Cain, inset *Am C E* * v 24; strain in metals, permanent effects, Thurston, discuss., insets * v 24 -**91**; testing, uniform methods, com. report * v 26 -**92**

Am M E standard tests, appendix to report * v 11, 11 -**90**; testing, autographic recording ap., Gray * v 13 -**92**; of construction, inspection of in U. S., Clapp and A. E. Hunt *Am Min* * v 19 **91** *E & Min* Feb 21, 28-**91**; atomic vol. and tensile strength, Fessenden *El Wld* * Aug 22; strength and testing, Kirkaldy, bk. review *Eng* May 15 *E & Min* Aug 15-**91**

E News strains in, Percy * Sep 8-**88**; standard testing methods for, Mar 7, Aug 22; the Kirkaldy testing system, A. E. Hunt, Sep 19-**91**; inspection of structural, U. S. *E Rec* June 6-**91**; testing, Paris lab., Andra, abs. *Inst C E* v 103 -**91** *Genie Civil* v 17 -**90**; elastic limit *Locom* Sep -**91**; testing, time tests Graham *The Eng* Feb 7-**90**. See also STRAINS, measurement; TESTING machines and names of materials

Mathematics, beginnings of, Richards *Sc Am Sup* Oct 18 -**90**

Matter, radiant, Crookes *Eng* Jan 23-**91**; molecular structure of, Anderson *Sc Am Sup* Nov 16, 23-**89**

Maxwell, William H. *Inst C E* v 91 -**88**

Mayer, Robert J. Von *Eng* Dec 16-**92**

McAlpine, William J. (full) *Am C E* v 26 -**92**, por. *E & Min* * Mar 15, por. *E News* * Mar 8 *Inst C E* v 100 -**90**

McConnochie, John *Inst C E* v 97 -**89**

Mead, Edwin H., por. *E & Min* * Dec 6-**90**

Measure, foot, old Japanese, Lyman *E News* * July 18-**91.** See also WEIGHTS and measures

Measuring, new planimeter, H. Shaw *E News* * Oct 13-**88.** See also INSTRUMENTS; SURVEYING, etc.

Measurements, refinements of mod., Brashear (full) *Sc Am Sup* Apr 5-**90**

Meat 'preservaline,' Terne *F Inst* Nov *Sc Am Sup* Nov 7-**91**

Mechanical engineering, mechanics of eng., Weisbach, bk. review *E & Min* Jan 31-**91**; mechan. prog., Price *F Inst* Oct -**89.** See ENGINEERING mechanical

Mechanical Movements, The Engineer's Sketch-book of, Barber, bk., Span, Lond. '89, review n *E & Min* Apr 11-**91**

POWER, 'overhauling' of a, Webb *Am M E* v 10 -**89**

SCIENCE, Anderson, addr. *Eng* Sep 20, 27-**89,** Noble, addr. Sep 12, 19-**90**

STOKERS, Roney *Am M E* * v 12 -**91** *E & Min* * Aug 29-**91,** (full) *R Gas* * Aug 29, (full) *Sc Am Sup* * Sep 27-**90,** (full) *St R J* July -**91**; machine stoking, Spencer, discuss., insets *Inst C E* * v 104 -**91** *The Eng* Jan 30-**91**; mechan. stoking, Whitham (full) *Pwr* * July -**91**; aut., Nunnery colliery, Sheffield *The Eng* * Oct 24-**90**; Conveyor * Sep 4; stoking and boiler house econ., Little, cor. Oct 9-**91.** See also BOILERS, stokers

UNITS, elec. and *E & Min* Aug 9 *The Eng* July 4-**90**; Greenhill, cor. Feb 22-**89**

Mechanics, illustrations, Preston *Eng* Mar 11-**92**; applied, Am. supremacy in, C. Sellers *E Mag* * Dec -**91,** pors. * Jan – Mar; Am., boasters?, Hagerty, Dec -**92**; lessons *Pwr* files Jan -**91** etc.

Meigs, Josiah and the U. S. Meteorological Bureau *E News* June 14-**90**

Meigs, Montgomery C. *E Rec* Jan 9-**92**

Memory, Huschfelder *Sc Am Sup* June 13-**91**

Men, average, wt. of crowds, n *E Rec* Dec 24-**92**

Mensuration, trapezoidal section, method of finding depth of half area, Michel *E News* * May 24, 31-**90**

Mercury, electrolytic method of separating from copper, Smith-Frankel *F Inst* June -**89**; Zaitsheff mine and works, Russia, Auerbach, abs. *Inst C E* v 94 -**98**

Mercury column, open, for high pressures, Bird *Am M E* * v 11 -**90**; columns, Calkins *Cassier's* * Mar -**92**

Meridian, determination of a, Marcy *E News* * July 18-**91**

Merrill, William E. *Am C E* v 26 -**92,** U. S. Eng'r Corps *E Rec* Dec 19-**91**

Messageries Maritimes rep. *Eng* June 29-**88,** ed. July 19-**89,** July 18-**90**

Metal cutting tools. See TOOLS, cast iron

Metallic, sulphides precip. by nat. gas, Kemp *E & Min* Dec 13 -**90**; carbonyls, Mond *The Eng* June 10-**92**

Metals, strain in, permanent effects, Thurston, discuss., insets *Am C E* * v 24 -**91**; wear of as influenced by chem. and physical properties, Dudley *Am Min* v 19 -**91**; tin and the tariff, Fletcher *Boston Traveller* Oct 3-**88**; Bull's pat. *The Eng* May 25-**88** *Eng* July 26-**89**; prices, diag., 1892 fluctuations, Dec 30-**92**; produc., Prussia '87 *E & Min* Sep 8-**88**; electrolytic sep., refining, Gore, Mar 16-**89**; produc. '89, Jan 4-**90**

E News metal interests in '89, stats., ed. Jan 25-**90**; bearing, alloys, Dudley, Mar 26 *F Inst* Feb, Mar -**92**; the Simonds rolling machine * July, com. report * Nov; coating, Ajax M. Co.'s proc., com. report, July; influence of aluminum on cast iron, Keep, Mabery and Voice, Sep -**88**; chilling, effect of on impact resist, Andrews *Inst C E* v 103 -**91**; aluminum bronze, Throop *Lehigh Eng J* Oct -**88**; wear of, Dudley (full) *R & Eng* Nov -**90**; fluid metal rolling, Bessemer * Dec -**91**

R Gas wear of, Dudley, Penn R. (full) Oct 10-**90**; effect of temp. on strength, Hibbard * May 6, 20-**92**; fluid, rolling, Bessemer *Sc Am Sup* * Nov 7-**91**; at high temps., Roberts-Austen * June 11-**92**; aluminum and alloys *The Eng* Oct 5-**88**; magnolia, for machine bearings, R. H. Smith report * Dec 20-**89**. See also ALLOYS and names of metals, as ALUMINUM, COPPER, IRON, STEEL, TIN; METALLURGY; SPELTER; SYLVANITE mine; TESTING machines — metals, etc.

Metal-work, artistic, Japan, Mezger *E & Min* Nov 1, 8-**90**

Metallurgy, Elements of, Phillips, bk., Griffin, Lond. '88 *The Eng* Nov 9-**88**; ferric sulphate reduction, C. Jones *Am Min* * v 17 -**89** and p 757; sci. prog. in west, Pearce, Pres. addr. v 18; tellurides working, proposed method, F. C. Smith * v 18 -**90**

Am Min of iron and steel, Brit. contribs. to, Kitson (Bess. invention) v 19, German prog. since 1876 and basic procs., insets, Wedding (full) * v 19; and dept. of economic geol. in U. S. Nat. museum, DeWey, v 19 -**91**; puddle and re-heating slags, util. for paint-stock, Sahlin * v 20; metals precip. from hyposulphite sol., sulphides refining, Stetefeldt, v 20, 20-**92**

Metallurgy

Eng barrel chlorination, Thies proc., Egleston, Aug 1; furnaces at Freiberg * 15-**90**; study of, Roberts-Austen, bk. review, Mar 13-**91**; chloridizing roasting and lixiviation, Yedras mine, Mex., Rockwell *E & Min* Feb 4, 11, Mar 3-24-**88**; sci. prog. in west, Pearce, Sep 21, 28-**89**; matte smelting, Lang, Aug 2-**90**; theory and practice, Roberts-Austen, Oct 17-31, (full) *Sc Am Sup* Oct 10, 17; parting bullion, Gutzkow *E & Min* Feb 28-**91** * May 7; chem. of Gossan, Emmens, Dec 17; Russell proc., Lamb, 17-**92**

F Inst imp. method of det. small per cents. of silver and gold in base metals, Whitehead, June -**92**; manganese applic. to, Hadfield, discuss., insets (very full) *Inst C E* * v 93 -**88** *The Eng* Mar 16-**88**; cupriferous pyrites in Huelva dist., Launy, abs. *Inst C E* v 101 -**90** *An Mines* v 16 -**89**; Przibram smelting works, Zdrahal, abs. *Inst C E* v 101 -**90** *Berg Hut Jahr* -**90**

Inst M E elec., Geipel, Feb -**88**; Smith *Sc Am Sup* Feb 11-**88**; lead, sil. and gold assaying notes, F. Clark *Tech Q* Feb **88**. See also EXHIBS., Paris, metallurgy; GOLD ores; IRON, phos. in; IRON and steel ores; LEAD; SLAGS; TIN ores and under names of metals and minerals

Meteorological, Royal Soc. exhib. *Eng* * Mar 28 * Apr 4 -**90**

Meteorology, Am. contribs. to W. Davis *F Inst* Feb, Mar -**88**; contribs. to, storms, Tatham, June -**89**; observ., Mt. Ven toux *Sc Am Sup* * Feb 4-**88**. See also AIR; STORMS; TORNADOES; WEATHER; WIND, etc.

Metric system, Greenhill *The Eng* Feb 3-**88**. See also WEIGHTS and measures

Mexico, Mex. valley drainage, Chism *E & Min* * Dec 8-22-**88**; onyx mines, Dec 26-**91**; people and prospects, ed. *E News* Feb 11; the floods in, ed. July 7; City of Mex., new and old, naming of sts. in * Dec 8-**88**, drainage * Apr 5, 12-**90**

Meyer, Christian H. *Inst C E* v 92 -**88**

Mica, U. S. indus., Cen. report *El Wld* May 23, Childs *E & Min* May 16-**91**; mining in No. Car., Phillips, Apr. 21, 28, May 5, 19, June 2-16 *Sc Am Sup* July 14-28-**88**

Michaelis, Otho E. *F Inst* June -**90**

Micro-organisms of air and water, Frankland *Sc Am Sup* Sep 15 -**88**, relation to chem. change, June 9-**92**

Microphone, evolution of, Tanner *El Wld* * Dec 13-**90**; expts. on Blake contact, Patterson *Tech Q* * Feb -**88**; cur. strength, Sabine, Feb; curs., Cross * Feb -**89**; transmitter, extent of the excursion of electrodes of, Cross, Aug -**90.** See also TELEPHONE, microphone

Microscope's contrib. to earth's hist., Bonney *Sc Am Sup* July 23-**92**

Microscopical, Royal Soc., Dallinger, Pres. addr. *Sc Am Sup* Apr 28-**88**

Middlesborough, Ky. *Eng* Aug 15, Boyd *E & Min* * Feb 8-**90** * Feb 5-**91** ? * Feb 13, 27-**92**

Miers, John W. *Inst C E* v 109 -**92**

Millar, William *Inst C E* v 91 -**88**

Miller, Daniel *Inst C E* v 96 -**89**

Military, eng., U. S. Telegraph corps *El Eng* * Aug 19-**91**; coast defence, Fiske's position finder * Nov 12-**90** *Eng* * Nov 27-**91**; countermining of Belfast Lough * Sep 2, 9 -**92**; electricity in sea-coast defence, Zalinski *El Rev* Oct 27, Dec 1-**88**; commun. in the field and torpedo warfare, Index of pubs., Fischer-Truenfeld, bk. n *El Wld* Apr 27 -**89**

R & Eng science, Califf, bk. n Feb -**89**, submar. mine and torpedo in harbor defence, do. * Dec -**90** * Jan-June; coast defence, Little * Nov -**91**; sea-coast batteries, Califf, Apr, May -**92**; cavalry on the battlefield, Liddell *Sc Am Sup* Sep 22-**88**; signaling (full) * Dec 20, 27-**90**; mil. engineer, King, Feb 13; telephony, single wire non-insulated * Nov 12-**92**; the kriegsspiel in Am., Livermore *Soc Arts Mass* -**90**; iron-work of Royal Artil. barracks, Aden *The Eng* * Mar 1-**89.** See also BUILDINGS, portable; FORTIFICATIONS; GUNS; GUNNERY and armor; NAVIES; TORPEDO-boats

Milk, separator, Hansen's *Sc Am Sup* * Jan 12-**89**; supply and pub. health, Sedgwick *Tech Q* Dec -**91**

Mill, the Sturtevant grinding *The Eng* * Feb 22-**89**

Milling, Flour manuf., Kick, bk., Crosby, Lockwood, Lond. '88; mod, Little *The Eng* Jan 6, Mar 2-**88**; exhib. * Aug 5-19-**92.** See also FLOUR mills

Milling cutters, Addy *Eng* Nov 7 * Dec 5, insets *Inst M E* * Oct -**90**; speed and feed *Eng* Oct 2-**91**; tools, Lister * Jan 1-**92** *The Eng* * Mar 22-**89**

Milling machine as substitute for the planer, Grant *Am M E* v 9 -**88** *R Gaz* Jan 6, abs. *Inst C E* v 91 -**88** *Am Machinist* Aug 27-**87**; heavy universal, Pedrick & Ayer *E. News* * Dec 6-**90**; and cutters *The Eng* * Mar 22-**89**

Mills, steam heating of, Worthen, inset *Am C E* * v 24 -**91**; use of compound engines for manuf. purposes, Main *Am M E* v 10 -**89**; construction, Woodbury *Cassier's* * Nov * Dec -**91**; new, U. S. n Jan; aut. sprinklers, Woodbury (full) * Feb * Mar -**92**; electricity in mill work, Hussey *El Rev* * May 9 *El Wld* 9-**91**

Eng engines, Thwaite, July 13, 20-**88**; designing and construction, Templeton's, Glasgow, collapse, report, Feb 14-**90**; slow-burning construction *E & Min* * Apr 4-**91**; construct. details, Hutchinson, inset (full) *E News* * Nov 10-**92**; and mill eng., Sawyer *E Rec* Dec 7-21-**89**, discuss. Jan 4-25, Feb 15, Mar 15, 22, Woodbury, June 21, one story * Aug 2, floors strength, Woodbury, Oct 18-**90** *J Assoc E Socs;* buildings, iron construct. *E Rec* * June 4, 11, Oct 29-**92**; evolution of the mod., Woodbury *Sc Am Sup* May 26, June 2-**88**; elec. driving (full) *The Eng* Nov 25-**92**

Mills, Clark, Vivarttas *R & Eng* July -**89**

Mills, William *Inst C E* v 108 -**92**

Mimeograph duplicating ap., com. report *F Inst* May -**89**

Minerals, of Ontario, Merritt *Am Min* v 17 -**89**, wurtzilite from Uintah mts. v 18 -**90**; extent and value, Cowlam *E & Min* Jan 7; resources, Tenn., Proctor, 7-**88**; stats. of '91, ed. *E News* Jan 9-**92**; names of, origin, Endlich, n *Sc Am Sup* June 16-**88**; colors of, Oct 11-**90**; gahnite or zinc-spinel, Rowe, Mass., vesuvianite, Newbury, Mass., Crosby *Tech Q* May -**88**. See also MONTANA; NOVA SCOTIA; TALC, etc. and names

ALASKA resources, Cen. report, Petroff *E & Min* Mar 28 -**91**

BOLIVIA resources, Minchin *E & Min* Aug 16-**90**

BRAZIL resources, Gibson *E & Min* Jan 18-**90**

BRITISH colonies mineral riches *Eng* Oct 17-**90**

CANADA, produc. '87 *E & Min* Mar 10, Apr 14, resources, June 9-**88**, produc. '88, May 18-**89**, '89, May 3-**90**, resources, Jan 3, produc. '90, table, May 9, 9-**91**, '91, Jan 2-**92**

GERMAN statistics *E & Min* May 31-**90**

GRANITE Mt Co. report *E & Min* * Nov 23-**89**

Minerals, GREAT Britain, and metal produc. *E & Min* Sep 29-**88,** produc. '91, Jan 2, stats. Apr 9, Aug 13-**92**
ITALY production '89 *E & Min* July 11-**91**
NEW Mexico stats., report *E & Min* Nov 29-**90**
NEW So. Wales exports, n *E & Min* May 24-**90.** See also MINS., Victoria
NOVA Scotia produc. '89 and '90 *E & Min* June 20-**91**
SPAIN and Cuba '86 *E & Min* Jan 14-**88**
UNITED States, Mineral Resources of, Day, bk., Wash., Gov't. Printing office; stats. '90, table *E Mag* May -**92**; products, 1882 - 86 *E & Min* Jan 7, '87 (full) July 28-**88**; Jan 12, table Feb 2, '88 June 15-**89**; 1882 - 87, Jan 4-**90,** Jan 3, market '90, 10; barytes produc., Parker, Cen. bull. Sep 12-**91**; produc. '91 and imports and exports, Jan 2, 2-**92**; *R & Eng* July -**89**; '88, table *R Gas* June 21-**89**; stats. '91, Jan 15-**92**; resources '87 *Sc Am Sup* Aug 25-**88**
VERMONT production '90 *E & Min* Dec 12-**91**
VICTORIA, New So. Wales, min. riches of *Eng* Dec 12-**90**
WAX, history *E & Min* July 6-**89**

Miner's inch of water in U. S. *E News* Dec 6-**90**; the Thomeburry safety lamp *Eng* * Nov 15-**89**; safety lamps, notes, Hughes *E & Min* * Mar 28-**91.** See also SAFETY lamps

Mines and mining eng. *Am Min* water supply system for hydr., Pearsall, wire rope haulage applic. to, Roberts, system in large bodies of soft ores, Rothwell * v 16, 16-**88**; indus. in relation to forrestry, Fernow, cultivation of mushrooms in abandoned at Akron, N. Y., Warren, v 17, 17-**89**

Eng industries, Paris exhib. Oct 11, Nov 29-**89,** Jan 24-**90**; prog. of art of, Foster, Feb 13, 27, Mar 20; settlement sanitation, Mault, Aug 14-**91**; investments, Wins *E Mag* Sep -**91**; Am. in '91, do. Feb; schools, Cranson, June -**92**

E & Min profits, U. S., markets, Am. and Lond. and stocks prices, Jan 7-**88,** Jan 12-**89** and files; Brit. stock market, Feb 4; systems in large bodies of soft ore, Rothwell * Mar 10; Drumlummon veins report, Clayton, Aug 4, 11; Manual for '88, Skinner, Lond., bk. Sep 8; promoting in Lond. Oct 20-**88**

E & Min how floated in Lond. (finances), La Trinidad, Jan 26-**89**; stocks in '89, tables, Jan 4; is close sizing before jigging advantageous, Munroe, Mar 29-**90**; profits, Jan 24; Potsdam brown ores in Va., Pechin, Sep 19-**91**; U. S., review various states, stocks fluctuations '91, Jan 2, 2: faulting in veins, Em-

Mines and mining

mons, May 21, Church, cor. June 11, 18; census pors. * Dec 3 -**92**; eng., Culley *E News* * Mar 10-**88**

Inst C E appliances in Westphalia, Malhet, v 92-**88**; bibliog. of *Sch of Mines Q* -**88**; prog. in art of, Foster (full) *Sc Am Sup* June 6-**91**; summer school of, topog., geol. and geodesy, Richards, Clark *Soc Arts Mass* -**89**; one month's work on two plane-tables, Richards, map, inset *Tech Q* * Apr -**91**; mine rents and min. royalties, Percy *The Eng* Mar 16-**88**; machinery, T. Brown, Aug 28-**91**; and metallurgy, Chic. exhib. * July 1 -**92**. See also ASBESTOS; BARYTES and umber; BLASTING; CANADA, Quebec, etc; COAL; EXPLOSIVES; MAGNETITE; PERU; PORT Henry; SILVER mining; TUNNELING; WINDING engines, etc.

ACCIDENTS *The Eng* Mar 30-**88** *E & Min* May 28-**92**; and prevention, Abel, bk. review, Dec 7-**89**, do. *Inst C E* v 90-**87**, discuss. (full) 91-**88**

ARGENTINE Repub. mines, Hausmann *E & Min* Feb 2-**89**

ARIZONA'S new bonanza, Storms *E & Min* * Aug 9-**90**

ARKANSAS mines, Branner *E & Min* Oct 20-**88**

ASPEN mt. ores, Col., Brunton, map (full) *E & Min* * July 14, 21-**88**; Co's elec. plant, Holt, Jan 23 *Am Min* * v 20 -**92**; notes on geol. and mines of Pitkin Cty., Henrich (full) * v 17 -**89**

AUSTRALIA, stats '89 *E & Min* Sep 13-**90**; and metallur. output '91, Oct 1-**92**; and metallur., Gordon reports, abs. *Inst C E* v 99 -**90**

BOHEMIA mines, Meier *E & Min* * June 11-25; and mills, Pribram, do. July 2-16-**92**

BOLIVIA, Huanchaca Co. *Eng* * Mar 21 *Sc Am Sup* * May 3 -**90**

BRITISH, Hunt, bk., Crosby, Lond. '87 *The Eng* Feb 24-**88**

BROKEN Hill Prop. Co. mine report *E & Min* * Oct 5-**89**

BUTTE, Mont. mining indus. '90 *E & Min* Jan 10-**91**

CAGE safety catch, Dunstan's, n *E & Min* * Jan 19-**89**

CAR, dumping cradles, aut., Munroe *E & Min* * Aug 24 *Am Min* * v 17 -**89**; car wheels friction tests, Norris * v 18 -**90**; car wheels, Susque. Coal Co. *E & Min* * June 14-**90**

CATORCE dist. mining, Chism *E & Min* * Oct 19, Nov 2, 30 -**89**

CHINA, prog., notes, Ellark *Am Min* * v 19 -**91**

Mines, CLAIM, rights of owner or possessor of lode, Noble (full) *Am Min* * v 18 -**90**

COMPANIES, promoting in Lond. *E & Min* Oct 20-**88**; how floated in Lond. (finances), La Trinidad, Jan 26-**89**; trustee promoters' obligations, Dunderberg case, Nov 1-**90**

COMSTOCK lode discov., DeQuille *E & Min* Dec 5, 19-**91**

CREEDE, Col. camp, Wins, insets *E Mag* * June -**92**

ELECTRIC, motor in mining, Mansfield *Am Min* v 16 -**88**; power transmission, Spaulding, insets (full) * v 19 -**91** *El Eng* Oct 8 *El Rev* * Oct 11-**90** *E Mag* * June, Van Depoele, Doe (full) *Sc Am Sup* * Jan 3-**91**; locoms. in German mines, Eilers *Am Min* * v 20; at Aspen, Col. Co., Holt * v 20 -**92** *E & Min* Jan 23; electric. relation to mining, Scott *El Rev Lond* Jan 15, Apr 15, 22-**92**; elec. transmiss. for, Leonard, May 29 *El Eng* May 13 *El Rev* * May 23 *El Wld* May 16-**91**; Michales machine *El Rev* * Mar 29 *El Wld* * Mar 29-**90**

El Wld Sprague system ap. * Jan 4; distrib. over extended areas, Snell * Mar 15; prog., Hazeltine * Sep 20-**90**; elec. work in mines, Snell, Sep 12; electricity in mining, coal cutting machine, Nov 28 * Dec 5-26-**91**; ventil. Jan 2 * Mar 12; limitations of elec. power in, Hale, (full) Apr 9 * 23, n May 14, Sperry (full) * June 25; transmiss., mines of Faria *Eng* * Oct 7, 7; elec. power in, Hale *E Mag* * Sep -**92**

E & Min use of electricity in, Chalon, Oct 5-**89**; applics., Hewitt * Feb 22; distrib. of energy in, Snell, Mar 29; electricity in, report, Oct 18-**90**; electricity vs. compressed air in relative effic., Lloyd, Oct 29-**92**; power (cost), Leonard *E Rec* May 30; machinery, Atkinson, discuss., insets (full) *Inst C E* * v 104-**91**; elec. mining, Brain *Sc Am Sup* * Dec 8-**88**; mine locom. * Mar 16-**89** *Industries*

GERMAN statistics, n *E & Min* May 4-**89**

HAILE mine, So. Car., geol. of, Thies, Mezger *Am Min* * v 19 -**91**

HOISTING, Koepe system of shaft winding, Harden *Am Min* v 17 -**89**; tandem water tanks for flooded slopes, Bowden * v 20-**92**; pneu. vs. cable, Wheeler *E & Min* * Oct 18-**90**

HOMESTAKE mining Co. report *E & Min* Oct 12-**89**

HONDURAS mining, Thatcher *Am Min* * v 20 -**92**

LAKE Superior copper mines, Hinsdale *E News* Oct 25-**90**

LA Plata del Libano mines, Dept. of Tolima, Columb. Repub., So. Am., Pierce *Am Min* * v 16 -**88**

Mines, LAW, mining, the N. Y., Raymond *Am Min* v 16 -**88**; U. S., end lines and side lines, do. (full) * v 17 -**89**; an end line case *E & Min* * Jan 26, Feb 2; bill, Aug 10-**89**; Quebec, May 2; right under common law, ed. July 4; Federal, ed. Oct 10, Hausmann, cor. Nov 14-**91**; U. S., Raymond, Jan 2; Mar 26, Apr 9, So. Car. phosphate case, 23-**92**

LOCOMOTIVE, Thom-Hous. mining, Erie coll. *El Wld* * Jan 4-**90**; in German mines, Eilers *Am Min* * v 20 -**92**

LONGDALE Iron Co., Va. mines, working and surveying methods, Johnson *E News* * June 13-**91**

LOW Moor, Va., mining in soft ores, Hungerford *Am Min* * v 17 -**89** *E & Min* * Oct 13-**88**

LUDINGTON, Iron Mt., Mich., distrib. of phosphorus in, Browne *Am Min* * v 17 -**89**

MAPS, strata-maps, method of constructing, stratification or bedding, Ives *Am Min* v 16 -**88**

MENOMINEE Range, Mich., methods of mining in, Fulton *Am Min* * v 16 -**88**

MOULTON Hill mine, Quebec gravity plane, Falding *E & Min* * Jan 31-**91**

MOVABLE platform for inclined planes in mines, Ruidant, abs. *Inst C E* v 94 -**88**

NASSAU, mines on the Lahn, Germany, Meier *E & Min* Oct 29 -**92**

NEW Zealand mines, bk. review *Eng* Jan 20-**88**

NOVA Scotia industry '91, n *E & Min* Oct 22-**92**

ONTARIO mine, Park City, Utah, hist., Almy *Am Min* v 16 -**88**

PORCUPINE mine, Port Arthur, Ont., Kirkland *E & Min* Apr 13 -**89**

PRATT mines, Tenn. Coal, Iron & R. Co., Ramsay, insets *Am Min* * v 19 -**91**

PROSPECTING in soft ground, econom. method, Ruttman *E News* July 6-**89**

PRUSSIAN mines '88, abs. *Inst C E* v 99 -**90** * *Zeit Berg Hut* -**89**

PUMP, mine *Cassier's* * June -**92**

ROSARIO mine, San Juancito, Honduras, C. A., notes, Leggett *Am Min* * v 17 -**89**

RUSSIA, mining '87, Kulibin, abs. *Inst C E* v 102 -**90**; and metallur. stats. '89, abs. v 109 -**92**

Mines, SHAFT sinking, through wet gravel and quicksand, Norway, Mich., Kelly *Am Min* * v 20 -**92** *E News* * Aug 8 *E & Min* * Nov 14 *E Rec* * Aug 8-**91**; by Poetsch-Sooysmith freezing proc. *E & Min* * Jan 18; through quicksand, Haase's system * June 21; Kind-Chaudron's methods * 28; freezing proc., Moran (full) *R Gas* * May 16 *Sch of Mines Q* Apr -**90**

SHOT-firing in mines, theory, Chalon *E News* * Jan 14-**88**

STAUNTON No. 6 mine, a well ventilated, Stockett *Sc Am Sup* * Nov 10-**88**

SUBMARINE mining, Bucknill *Eng* Jan 6 * 20, 27 * Feb 10, 24 * Mar 9, 23 * May 11 * June 1, 15, 29, July 13, Aug 17 * Oct 5 * Nov 23-**88**

TASCO district, Guerrero, Mex., Chism *E & Min* July 13, 20-**89**

TELEGRAPH, the old, Utah, Laraguino *Am Min* v 16 -**88**

TILLY Foster mine, elec. ore-dressing, McDowell *E News* Oct 4 -**90**

VENTILATORS, centrif. mine, expts., Norris (full) *Am Min* * v 20 -**92**

Mining Engineers, Am. Inst., mission of, Potter, Pres. addr. *Am Min* v 17 -**89,** European trip '89, v 18 -**90,** pro. *Eng* May 18, 25, June 8 * Aug 10, 17 * Nov 30 * Dec 7, 14-**88,** May 3, 31 * June 7-**89,** Mar 21, 28, Apr 18, Hewitt, Pres. addr. Oct 24, 31, Nov 7-**90,** Oct 9, 16, Nov 13-27-**91,** Mar 25 * Apr 8, 29-**92** *E & Min* Boston pro. Feb 25, Mar 3, Oct 6-**88,** Mar 2, Oct 5, 12-**89,** Feb 22, Mar 1, Oct 4-25, Nov 1-**90,** June 13, Oct 10 -**91,** Feb 20 * July 2, 9, Dec 24-**92** *E News* Mar 3-**88,** Feb 27, July 7, Oct 20-**92** *Sc Am Sup* * Jan 26-**89** *The Eng* Mar 18, 25, Nov 11-**92**

FEDERATED Inst. of Mining Eng'rs *The Eng* Sept 16-**92**

METALLURGICAL, and, of three nations, N. Y. pro. *E News* Oct 4-25, Nov 1-22-**90**

Mint. See U. S. mint

Mirror, Japanese magic *F Inst* * Jan, Apr -**88**

Miss. river and Giuseppe Beltrami *Locom* Mar-**90.** See RIVERS, Miss.

Mitchell, J. E. *F Inst* Apr -**88**

Molasses distillation, Hutchinson *Sc Am Sup* Oct 10, Debremond, 17 -**91**

Molding machine, Tabor *Am M E* * v 13 -**92**

Monetary unification and universal bank scheme, Granier *E & Min* * May 17-**90**; money question, Mar 7-**91**

Monitor, as it is, cor. *The Eng* Mar 7-**90**
Montana, Rainbow lode, Butte City, Blake, geol. of Butte, Emmons, minerals assoc. in Gagnon vein, Butte City, Pearce *Am Min* v 16, 16-**88**; Flint Creek mining dist., Goodale, v 18 -**90**; the treasure state, map, Ralph *Harper's M* * June -**92**
Monte-jus, self-acting (fluid measuring ap.) *Eng* * Dec 12-**90**
Montreal, harbor imps. *E News* * May 2-**91**; rapid transit system proposed, Wicksteed, n * May 26-**92**
Montresor, Charles E. C. *Inst C E* v 106 -**91**
Monument, the Columbus, Barcelona, Spain *Sc Am Sup* * Dec 1, 29 *The Eng* Nov 23, 23-**88**
Monumental fountain, Paris exhib. *Sc Am Sup* * Feb 16-**89**
Moore, James M. *Inst C E* v 107 -**92**
Moore, William *Inst C E* v 97 -**89**
Morant, Ernest F. *Inst C E* v 95 -**89**
Morant, John H. *Inst C E* v 110 -**92**
Mordey, W. M., por. *El Wld* * Aug 8-**91**
Moreland, Richard *Inst C E* v 104 -**91**
Morland, Henry *Inst C E* v 106 -**91**
Morocco, (min.) wealth of, Howarth *E & Min* Apr 12-**90**
Mortars. See CEMENTS and mortars
Morton, John H. *Am C E* v 26 -**92**
Motion, graph. anal. of recip., O. Smith *Am M E* * v 11 -**90**; sensations of, A. Brown (full) *Sc Am Sup* Oct 12-**89**. See also MASS and motion
Motors, Keely, T. C. Smith *E Mag* Oct -**91**; without fuel and second prin. of thermodynamics, Mehner *F Inst* Aug -**92**; small, comparative working expenses, Korte, abs. *Inst C E* v 105 -**91**; small, es. of cost, gas and elec., Davis *Sc Am Sup* Jan 9-**92** *Am Gas Lt'g J.* See also ELEC. — GAS motors
Moulding sand, mechan. treatment of, Bagshaw *Eng* * Feb 27 -**91**
Mountains, slide, notes on a, Curtis, discuss., insets *Am C E* * v 24 -**91**; (roots of) our molten globe, Wallace *Littell's* Dec 24-**92**; White Mts., hist. *Locom* Oct -**91**; highest peaks of No. Am. *Sc Am Sup* Oct 11-**90**
Mud in Persian and Eastern architecture, Simpson *Sc Am Sup* * July 30-**92**
Muir, James *Inst C E* v 96 -**89**
Muir, William *The Eng* Aug 24-**88**
Muller, Max, por. *Sc Am Sup* * Oct 22-**92**

Mummies, Cal., W. Anderson *Sc Am Sup* Aug 25-**88**

Municipal eng., ownership of commercial monopolies, Foote *El Rev* Mar 9 *El Eng* Mar -**89**; lighting, Francisco, Aug 27 *El Rev* Aug 30-**90**; ownership of industries, Foote, Jan 10-**91**; work in Nottingham, A. Brown *Eng* May 13, 27; munic. gov't., evils of, Black *E Mag* Apr -**92**

E News Pullman, Ill. Mar 31; Vienna, cost of, n Apr 14-**88**; monopolies, Jan 4; city refuse, econom. disposal, Foster, Mar 15; Liverpool, England, Oct 4 * 25-**90**; refuse disposal in Am. July 18; Boulnois, Sep 12-**91**; house refuse disposal, Liverpool, England, Boulnois, June 2; st. cleaning cost and methods of paying, Washburne report, Sep 29 -**92**

E Rec (Town) refuse destruction, Codrington report * Sep 15, 22, Oct 13, 20, Dec 22-**88**; water supply for munic. purposes, Emery, July 4; (scope of work) Sep 19; notes abroad, Hering, Sep 26-**91**; St. Louis, Moore, Jan 23; Boston, 30, st. dept. report, Apr 23-**92**

F Inst sts. and pavements, Haupt, Dec -**89**; Am., French opinions, Le Rond *R & Eng* Nov -**88** *An Ponts;* city refuse and garbage disposal, Foster *Sc Am Sup* * Jan 23-**92** *Eng;* munic. monopolies, Sinclair, state treatment of corp. property *Scribner's M* Nov *St R J* Oct -**91.** See also CITIES; PAVEMENTS; ROADS; SEWERS; STREETS; WATER-works, etc.

Murton, Frederick *Inst C E* v 96 -**89**

Muscular fatigue, Morso's ergograph and ponometer *Sc Am Sup* * Nov 15-**90**

Musgrave, Joseph *Inst C E* v 104 -**91**

Musical instrums., construct. and capabilities, Hipkins (full) *Sc Am Sup* Sep 5-19, new keyed for just intonation * Oct 17-**91**

Nails from tin-scrap, O. Smith *Eng* * Oct 11 *Sc Am Sup* * June 8 *Am Min* * v 17 -**89**

Nantes port *Eng* July 19 * 26 -**89**

Naphtha yacht Mignon, aluminum *Eng* * Sep 9-**92**

Nasymth, James *Eng* May 9 *Locom* June, mechan. inventions of *The Eng* * May 16, 23-**90**

Natural gas. See GAS, natural

Naval Annual '91, Brassey, bk. review *Eng* July 17-**91**, '92 do. July 1-**92**, bk. review *The Eng* Apr 13-**88**

Naval Architects, Inst. of, pro. *Eng* Mar 23, 30, July 27, Aug 3, 10-**88,** Apr 12-26, May 3-**89,** Mar 28, Apr 4-18-**90,** Mar 20-27, Apr 3, 10, July 17, 31, Aug 7-**91,** Apr 8-22-**92** *The Eng* Mar 23, 30, Aug 3-17-**88,** Apr 12, 19-**89,** Mar 28, Apr 4-**90,** Mar 20, 27, Apr 3 * July 24, 31-**91,** Apr 8-22-**92**

Naval eng., Southampton works *Eng* * Oct 17-**90**; U. S. prog. notes *R & Eng* Feb, Mar, June, July; warfare, eng. in, ed. Nov -**89**; warfare, position of the torpedo in, Grenfell *The Eng* May 4; architecture at Glasgow exhib. May 18, June 8, Aug 24, Sep 7, 21, Oct 12, Nov 16; naval forces of world, June 1-**88**; constructor corps, June 19, Aug 14-**91.** See also BOATS; MARINE eng; NAVIES; SHIPS; STEAMERS; TORPEDO boats, etc.

Naval engineers, ed. *Eng* June 17, training, July 8-**92**; insignia of officer's rank *Sc Am Sup* * May 30-**91**; promotion (questions), Tracy Sep 10-**92**; *The Eng* Dec 19, 26-**90**; pay, Jan 30; in mercantile marine, Feb 13, cor. 13, Mar 6, Oct 2; for the naval reserve, 16-**91**

Navies (war-ships), limits of the battle-ship, Kent *Cassier's* Nov -**91**; elec. equip of mod., Hutchins * Apr * July -**92**; elec. work in, Bradford report *El Rev* * Dec 28-**89**; elec. light plant management on warships, Jan 24-**91**

Eng warships of the future, Albini, Aug 24-**88,** armor of, Barnaby, Apr 12, machin. of, ed. Aug 9; coaling the navy, July 19-**89**; warships of world, Aug 22; protection of ships, Barnaby, Dec 12-**90**; building, future policy, Brassy, Mar 20, 27; Armstrong builder * July 31-**91**; electricity in, Hamilton, May 6; dimens. of warships, Wilmot, July 8; the Ward ram * 15; electricity in, Deadman, 29, Aug 5-**92** *Inst M E*

E Mag warship building * July; armored, limit of, Wins, Nov -**91**; new warships of world, n *E News* July 25; the mod. navy, ed. Sep 5; elec. lighting of, Hutchins * Dec 5, 12-**91**; propelling machin. of mod., Wells, insets *Inst C E* * v 91 -**88**; building, new programme, W. H. White, v 98, armor for, Barnaby, discuss. (full) * v 98 -**89**; mod., Meigs *R & Eng* Apr -**89**; foreign warships, list * Nov -**90**; war monitor Terror *Sci Am* Dec 1-**88**

Sc Am Sup warships of future (full) * Nov 3-**88**; propelling machin., Oram (full) * Apr 6; alternative designs * 20; armor for, Barnaby * June 8; coaling (ap.), Greet * July 13; armor plate expts. * Aug 31 * Sep 7, 14; monitors, neglected, Brice

Navies

Dec 7-**89**; naval warfare, 1860-89, Clowes, Oct 18; the first monitor, n 25-**90**; Purdy's twin warship * Feb 21; navies of world, relative strength, n May 2; armor plating, France and Great Brit. * Oct 3-**91**

The Eng warships of the world, Lloyd's Register of Shipping, bk., Lond. '88, July 6-**88**, '92, bk. review, Aug 12-**92**; alternative designs for * Mar 15, designs, W. H. White * Apr 12-**89**; submarine mine str. * Mar 28-**90**; mod. dimens. of Eardley-Wilmot, July 15; power transmiss. and distrib. in, Soliani, 29, Sep 2, 9-**92**. See also STEAMERS; TORPEDO boats, etc.

ARGENTINE cruiser '25 de Mayo' *Eng* Nov 14-**90**; twin screw ar. clad ram Libertad, Nov 18 *The Eng* Nov 18-**92**

AUSTRIAN, Chilian, French, etc. warships *R & Eng* * Apr -**91**

FRANCE, elec. lighting Marceau, Hutchins (full) *El Wld* * Jan 23 -**92**; *Eng* June 6-20, Amiral Baudin * July 4 * Aug 15 * Nov 14 * Dec 12-**90** * Feb 20 * July 24 * Aug 7, inset 14, 28 * Oct 9, 30 * Dec 25-**91**; English and Russian *E News* June 23-**88**

R & Eng armored cruisers * May -**89**, Charner ar. cruiser * Aug -**90**; * Apr; Le Tage warship * July -**91**; and English, n * Mar * June * Sep * Oct -**92**; warship Forbin, unarmored cruiser *Sc Am Sup* * July 26-**90**; ar. plating of, France and Great Brit. * Oct 3-**91**; naval manœuvres *The Eng* July 25, Aug 1, 8; 20 years of naval construct. Oct 17, Nov 14-**90**; warships * Aug 28-**91**

GREAT Britain *Eng* naval manœuvres, ed. Jan 6, estimates, eds. Mar 9, Dec 21; the Magicienne and Marathon, inset * May 18 -**88**; strength of, ed. Feb 15; estimates, Mar 29; warships, Apr 5, 12, design, W. H. White, 12 * 19; coaling, Longridge, July 19; contract work, ed. Oct 18; ed. Nov 29; naval mobilization, bk. review, Dec 27-**89**

Eng estimates, ed. Mar 14; Barraccouta accident, 14-28 * Apr 18; naval manœuvres, White, Mar 28; stern-wheel gun boats * May 16; navy additions in '90; Dec 19-**90**; estimates, ed. Feb 27, Mar 6; new warships, Brit. and foreign * Feb 27 * Mar 6; 2d class cruiser Thetis * Oct 23; additions '91, Dec 18-**91**

Eng warships Edgar and Hawke * Jan 1, inset 15; H. M. S. Grafton, Feb 5; Brit. experience with warships, White, Apr 15, 22; battle-ship Ramillies, inset * Aug 12 * Sep 30; cruisers Pique, Rainbow and Retribution * Nov 4; H. M. S. Vulcan * 18; additions, Dec 30-**92**

Navies, GREAT Britain

E News English, French and Russian, June 23-**88**; the Ward ram for, June 1; warships design in England * Aug 24-**89**; speed trials of, Capper, inset *Inst C E* * v 95 -**89**

R & Eng new, Apr; warship Nile, June; new fast cruiser Magicienne * July -**88**; new * June; warship Benbow, n * Aug; battle-ship Inflexible * Sep -**89**; armored cruiser Imperieuse * Apr; battle-ship Trafalgar * May; fast cruiser Medusa * Nov -**90**

Sc Am Sup warship Victoria * July 14, Magicienne and Marathon * July 7-**88**, Benbow * July 20, Collingwood * Nov 9-**89**; cruiser Blake, trials * Dec 12-**91**; H. M. S. Vulcan * Nov 12; cruisers Pique, Rainbow and Retribution * Dec 17-**92**

The Eng naval power, Symonds, Feb 10; armed cruisers, ed. July 13; belted cruiser Australia, Dec 7-**88**; str. Victoria, insets * Feb 15, Edinburgh * Apr 5, Benbow * June 7, the Inflexible * Aug 2, the Collingwood * 4-**89**, Imperieuse * Jan 31, 31, Trafalgar * Feb 28, Medusa * July 4; estimates, Mar 14; condition, Aug 1; naval manœuvres * 29-**90**

The Eng warships Royal Arthur and Royal Sovereign * Feb 20 * Mar 6, Victoria, hist. and construct. * May 1; at Chatham dockyard * July 24; str. Great Britain * Aug 28; ar. plating on, France and Great Brit. * Sep 4; engineers for the naval reserve, Oct 16-**91**

The Eng navy estimates, Mar 11; H. M. S. Royal Sovereign, inset * May 27; navy artificers, June 17; navy (list) July 1, 8; Capt. of the 'Mary Rose,' Clowes (full) * July 29, Sep 16; Vulcan, inset * Oct 7-**92**

ITALY, warship Italia *R & Eng* * Apr, inset *Eng* * Feb 17; ironclad Lepanto, trials, Soliani * Aug 24-**88**; fast cruiser Piemonte * May 3, 31 *R & Eng* * Aug, Watts *Sc Am Sup* * June 1 *The Eng* * Apr 26-**89**; warship Re Umberto *R & Eng* Dec -**88** *The Eng*

JAPANESE cruiser Chiyoda, inset *Eng* * Oct 10-**90**

RUSSIAN, English and French *E News* June 23-**88**, n *R & Eng* Sep -**89**

SPAIN, warships building *Eng* Sep 12-**90**; cruiser Pelayo * Mar 20, *R & Eng* * May -**91**

UNITED States of Am. *El W'ld* elec. equip., Hutchins * Jan 31 * Feb 7-**91**; *Eng* design, W. John * Mar 30; pneu. dynamite gun cruiser Vesuvius * May 25-**88**, inset * June 7-**89**; cruiser

Navies, UNITED States

Chicago * Aug 22, speed trial data, note, Mansel, Oct 10-**90**; cruiser Maine * Jan 9; Biles * Mar 27, 27 * Apr 3; cruiser Yorktown * Mar 27 * Apr 24; navy exhibit, Columb. exhib., insets * Dec 4, 11-**91**

E News new protected cruiser, n Sep 20; battle-ship Texas, casting low pressure cyl. for * Nov 29-**90**; battle-ships, stat. n May 30; cruiser 12, propelling machinery, inset * Aug 15; navy of 1891, Dec 12-**91**; machinery of cruiser New York * Jan 23 -**92**

R & Eng warships, Jan – * Mar, Texas, gunboat Yorktown * June -**88**; elec. light installs. for, Veeder (full) * Oct; English view of, Dec; naval prog. (very full) * Sep -**89** – Jan * Mar – Aug * Nov -**91** * Jan, n * June – Sep -**92**; cruiser 12 * Oct * Dec -**90**; navy in time of peace, Barroll and report, Jan, Jan – * May; dynam. cruiser Vesuvius trial, July -**91** *Sci Am* Nov 3-**88**; Mar 23; gunboat Yorktown, Feb 2 *Sc Am Sup* * Mar 2-**89**; designs, Biles, Apr 11; new gunboats Yorktown, Concord and Bennington, May 9-**91**; cruiser 12, the Columbia * Oct 29-**92**

The Eng dynamite cruiser Vesuvius, notes, Mansel, July 5, Dec 27-**89**; proposed warships, ed. Jan 31, Philadelphia, trial report, Aug 8-**90**; twin-screw steel cruiser Charleston * May 22; cruiser San Francisco * June 19; cruiser 6, machinery, inset * Oct 16 * Nov 6, 6; navy, Oct 30-**91**; cruiser 12, the Columbia * Aug 19; companion of propellers, Griffith, table, Oct 7; vessels, table, 21-**92**. See also U. S., prog.

Navigation, Atlantic, prog., ed. *Eng* June 20; inland, India, prog. of steam, Bolton, inset *Inst C E* * v 99 -**90**; inland in Italy, Manara, abs. v 105 -**91**; first sextant *Locom* Oct -**90**; steam, history, H. Smith *Sc Am Sup* Aug 11-**88**; inland in France *The Eng* Oct 7-**92**

Navy yards, Brooklyn *Eng* Oct 17-**90**; League Is. report, inset and ed. *E News* * Nov 23, 23-**89**; Boston *Sc Am Sup* Dec 5-**91**

Neilson, Walter M. *Inst C E* v 100 -**90**

Newberry, John S., por. *E & Min* Dec 17-**92**

Newdigate, Albert L. *Inst C E* v 92 -**88**

New England pop. movements, ed *E News* Oct 11-**90**

New Jersey coast movements, littoral, beach protection and jetty reaction, Haupt, discuss., insets (full) *Am C E* * v 23 -**90**

News, the press as a newsgatherer, W. H. Smith *El Wld* Aug 8-**91**

New So. Wales, mineral resources, Wilkinson (full) *Sc Am Sup* Nov 14-**91**

Newspaper, an Am., business dept., Siegfried *Sc Am Sup* May 28, Apr 4, journalism, assoc., Wilcox, 11-**91**

New York city, and Lond. traffic growth, Reckenzaun *El Rev Lond* May 24-**89**; making of a model, Foote *El Rev* Oct 3; rapid transit, Sprague, Mar 7, Sprague's solution *El Wld* sup. Feb 21, Mar 7, (full) May 30-**91**

E Mag rapid transit prob., Gribble * May, n July -**91**; san. prog. in, Wingate, June; N. York's commercial blight (harbor property), Black * June * July -**92**; rapid transit *E & Min* * Mar 23-**89**; future of, Kent, July 26, Aug 2-**90**; Rap. Tran. Commission report * Oct 24-**91**

E News pass. movement diag. * Feb 18; city value, ed. Mar 31; past and future of, pop., tables and stats., ed. Apr 22, growth * May 5-19; Brooklyn and, relative residence areas, inset map, met. development, ed. Mar 17, 17, growth, ed. Nov 3 -**88**; the transit prob., cor. * July 27, Commission probs. Aug 10; real estate, lot value, n Oct 26-**89**; rapid transit facilities, ed. Jan 4; death rate, 11; st. dept. Feb 1; subways at Broadway and Fulton sts., inset * Nov 1-**90**

E News in 1890, n Jan 10; borings for rock along Broadway, diag. * July 18; Rapid Transit Commission's report, diag. * Oct 10, 17, plans, inset, ed. (full) * 24, 24; pass. traffic, past and future of, ed. 31-**91**; rapid transit, Reno system * Apr 2; rapid transit plans, Broadway franchise sale and specs., insets, ed. * Nov 24, 24 * Dec 1-**92**

E Rec proposed subway, Adams * Aug 4-**88** * Feb 8; st. lighting, Love, Apr 5-**90**; st. cleaning, com. report, Mar 28; rapid transit prob. Oct 10, Steinway commission report * 24, munic. ownership arguments, Prout, Nov 21, Croes, 28; scant water supply, Adams, cor. Nov 21-**91**

R & Eng pass. travel, n Feb -**88**; rapid transit, Nov -**91**; do., Cooper *R Gas* Mar 20, Gribble, Apr 3, W. White * 24, reports, ed. Oct 9, (full) * 16, 23, 23, Nov 20-**91**; defence and attack, Bucknill *Sc Am Sup* * July 7-**88** *Eng;* rapid transit plans, Gribble *St R J* May -**91**. See also BRIDGES, Brooklyn; BUILDINGS; ELEC. wires, underground; MUNIC. eng; PAVING; RAILROADS, elevated; SEWERS; STREET railroads; WATER-works, etc.

New York state survey, final results of triangulation, bk., Weed, Parsons, Albany '87

Niagara Falls, life hist. of, Pohlman *Am Min* * v 17-**89**; tunnel, Werner (full) *Cassier's* * June; the motor for the World's Fair, Trowbridge *El Rev Lond* Feb 5-**92**; power util., Sellers *El Rev* Aug 29-**91**, Ganz * Mar 19-**92**, scheme *El Wld* * Feb 9, Hamilton plan, Watts, Mar 2, * Aug 10-**89**; power plant * Feb 6; transfer to Chic., two proposed methods, Perkins * 20, * Sep 24-**92**

Eng life hist. of * Mar 22-**89**; util. * Sep 26 * Oct 17-31, Nov 7, 14-**90** * Jan 2, Feb 27, projects, Oct 23, Nov 3, 20-**91**, Ganz scheme, inset * Feb 19; Power Co. 5,000 h.p. turbines, inset, ed. * Dec 23-**92**; util., C. Sellers *E Mag* * Sep *E Rec* Aug 8, 15 *F Inst* July *R & Eng* Aug *R Gaz* July 17-**91**; retrocession of, Pohlman *E News* Dec 15-**88**; util., Herschel * Jan 23; tunnel * Dec 29-**92**; water vol., Bogart *E Rec* Mar 21-**91**; power plant * Sep 24-**92**; util., inset (full) *Iron Age* * Dec 8 *The Eng* Oct 14-**92**; Power Co. *Pwr* * May -**90**, works *R Gaz* * Dec 23-**92**

Nichols, Edward L., por *El Wld* * July 12-**90**

Nickel, ore, Russell Springs, Logan Cty., Kan., Dewey *Am Min* v 17 -**89**; and iron alloys, magnetic properties, Hopkinson *El Wld* * Sep 6 *Eng* * Sep 5; Sudbury mines, prov. Ontario * Nov 21-**90**; and steel alloys, Riley, May 17-**89**; ore smelting plant for New Caledonia * Mar 4-**92**

E & Min and cobalt, New Caledonia, Heard, Aug 11-**88**; and cop. deposits of Sudbury, Can., Bell, Mar 14; nickel-carbon oxide and applics., Mond, Sep 26-**91**; U. S. produc. '91, Ingalls, Jan 2; deposits of No. Car., Emmens, Apr 30; ores, New Caled., geol. and metallurgy of, Levat, July 9; anal., Emmens, Nov 26-**92**

E News nickel-steel, Am. Dec 13-**90**; metallurgy of, Levat, abs. *Inst C E* v 110 -**92** *An Mines* v 1 -**92**; and uses, Donald *Pop Sci* Dec -**92**; and steel alloys, Riley (full) *Sc Am Sup* Aug 24-**89**; and iron, volatile compounds, Townsend, Apr 23-**92**; carbon oxide and applics., Mond, Oct 10 *The Eng* Aug 28-**91**

Nickel-in-the-slot machines, Aughinbaugh (full) *Sc Am Sup* * Apr 11-**91**. See also SLOT machines

Nicoll, Donald *Inst C E* v 108 -**92**

Nitrate of soda, indus., Chili, n *E & Min* Feb 2-**89**, deposits and trade, do. Aug 9-**90**; Nichols's report, abs. Jan 17-**91**; deposits, Chili, Walker report *E News* June 14-**90**; fields of Chili *Littell's* May 21-**92**. See also SODA nitrate

North Carolina, Western, geol. of Hiawassee val., notes on topog., inset map, Colton *Am Min* * v 16 -**88**

Notes, memoranda, classification of *R & Eng* Sep -**91.** See also INDEXING

Nova Scotia minerals, geolog. relations, Gilpin *Am Min* v 18 -**90**

Nozzles, and diverging tubes, best form of, Nagle *Am M E* * v 9 -**88**; flow of water through, expts. See FIRE streams.

Numbers, favorite, A. Williams *Sc Am Sup* * Mar 16-**89.** See also ARITHMETIC

Obesity, physiological treatment of, Mendelson *Sc Am Sup* Apr 5-**90**

Observations, the average observer *R & Eng* Aug -**91**

Ocean, racing, ed *Eng* Aug 29, Bucknill, cor. n Sep 5, 5-**90**; temps. and submarine cables, Carpenter, Nov 9 *The Eng* Nov 16-**88**; Pacific, abysses of *E News* Aug 3-**89**; No. Atlantic pilot chart, map, Hayden *F Inst* * Apr, June -**88**

Office organization and equip., E. D. Leavitt's, Cambridgeport, Mass. (full) *E Rec* * Dec 3-**92.** See also ARCHITECT'S offices

Ogilvie, Charles E. W. *Inst C E* v 103 -**91**

Oil-cloth waste util., Lance's method, com. report *F Inst* Oct -**88**

Oil engines, Knight's *The Eng* * Aug 16-**89**; the Trusty * Dec 4 -**91.** See also PETROL. engines.

Oils, ethereal, notes on *Sc Am Sup* Mar 31-**88**; maize, in pharmacy, Kennedy, Oct 19-**89**; essential, notes, Jan 11-**90**; and fats, notes, May 2-**91**; for light-houses and light-ships, Edwards (full) Mar 19-**92**; ap. for det. liability to spontan. combust., E. Richards *Tech Q* * Dec -**91**; the Broxburn works *The Eng* Aug 31-**88.** See also GAS, oil-gas; GREASE; LUBRICATION; PETROLEUM

ADULTERATIONS detection by Abbe's refractometer, Duffield *Sc Am Sup* * June 1-**89**

COTTON-seed, indus., E. Thompson *E Mag* * Sep -**92**; indus. applics., Grimshaw *F Inst* Mar -**89**; Thornton *Sc Am Sup* May 26-**88**; Tompkins (very full) Nov 28-**91.** See also COTTON-seed oil

CYLINDER *Sc Am Sup* Jan 16-**92** *Chem Tr J*

FIELDS, the Florence, Col., Eldredge *Am Min* * v 20 -**92**; So. Am. *Eng* Oct 14 * 28-**92**; Col., Newberry *E & Min* Dec 15 -**88**; of Barren Cty., Ky., Fischer * Feb 15-**90**; Wyoming, Rigge report *Sc Am Sup* June 23-**88.** See also PETROLEUM

Oils, FUEL, liquid, Francisco *Sc Am Sup* Apr 6-**89.** See also BOILERS — LOCOMS., fuel; FUEL, liquid

KEROSENE, commercial, safety of, Newbury *Sc Am Sup* Nov 10 -**88** *Am Chem J*

LINSEED, Duff *Sc Am Sup* Feb 25-**88**; boiled, expts. on prep. of, Thorp, July 5 *Tech Q* Feb -**90**

LUBRICATING, exam., Stillman *Pwr* Sep -**90** *Steven's Indic;* rapid method of det. compos. of, Gupper *Sc Am Sup* Apr 9-**92** *Chem News.* See also LUBRICATION

MIXING plant, Lehigh Val. R., Coleman (full) *R Gaz* * Apr 10-24-**91**

PAINT *Sc Am Sup* June 13-**91** *Chem Tr J.* See also OILS, linseed.

PARAFFIN, manuf., Stewart (full) *Sci Am Sup* May 4-**89**

PUMPING and engine data *E Rec* * July 4-18-**91**

STANDARD Oil Trust's agreement (full) *E & Min* Mar 3-**88**; ten years of, Dodd *Forum* May -**92**

TESTING machine, East. R., France *Eng* * Mar 14, 28-**90**

Oklahoma, new territory *E News* Apr 20-**89**

Okonite *El Rev Lond* June 8-**88.** See also ELEC. insul., okonite

Oldham, James *Inst C E* v 103 -**91**

Oleomargarine manuf. *E & Min* Mar 2-**89**; Caldwell (full) *F Inst* Sep *Sc Am Sup* Dec 10-**92**; Babcock (full) July 5-**90**

Opium industry, Weir *Sc Am Sup* Sep 21-**89**

Optical projection, Salomons *Sc Am Sup* Dec 17-**92.** See also MAGIC lantern

Ore *Am Min* Blake crushing system and results; deposits, structural relations, Emmons (full); magnetite concen. with Conkling jig at Lyon mt,, N. Y., Ruttmann; and matte-roasting in Utah, Terhune * v 16, 16-**88**

Am Min concen. of low-grade ores, Armitage; the Davis-Colby ore-roaster, Valentine, the Howells roasting furnace, additional diaphragm, Goodale; deposits stripping, McDowell * v 18, 18-**90**; sampling, new system, Bridgman (full), without machinery, Glenn * v 20 -**92**; the Lamberton crushing mill *Eng* * Apr 11-**90**; pub. sampling works, Wins *E Mag* Apr -**92**

E & Min ore sorting, Bartlett * Apr 14; deposits of Red mt. mining dist., Col., Kedzie * Aug 11-**88**; metallur. experience, Ontario mine, Utah, Janin, Jan 18; anal scheme for smelting

Ore

Dougherty, Feb 8; deposits, isochemic lines in, Browne * Apr 19; deposits and mines of Minas Geraes, Brazil, Mezger, Raymond, Aug 30, Sep 6-**90**; deposits of Pioche, Nev. Feb 7; supply for Vir. furnaces, Pechin, Mar 14, 21, cor. 28-**91**

E & Min sampling at El Paso, Tex., Johnson, Jan 16, 23; deposits of Creede, Col., MacMechen * Mar 12, Kuby * 19; deposits of Newman hill, Rico, Col., Farish * Aug 20-**92**; dressing in Germany *The Eng* Aug 15-29-**90**. See also COLORADO; COPPER; IRON; NOVA SCOTIA; SILVER; TIN ore, Can. — Col., etc.

Organic, anal. by combustion, W. Dudley *Sc Am Sup* * Jan 12-**89**; forms, causes of variation in, Riley, Nov 17, 24, Dec 1, 8 -**88**; chemistry reforms in nomen., Burns *Tech Q* * Oct -**92**

Organs, elec., Swinburne *El Wld* * July 4-**91**, do. Paris exhib., Hering *F Inst* June -**90**. See also ELEC. organs.

Oscillating engines, relative piston speeds, MacCord *Sc Am Sup* * Oct 31-**91**

Otto, Nicolaus A. *Eng* Feb 6, por. * Mar 20, por. *Sc Am Sup* * Apr 18-**91**

Oxygen, extraction, Murray *Eng* Feb 7; cyls. testing * Apr 11-**90**; atomic wt. Oct 7, ed. 28-**92** *Compt r*; indus. extraction and use *E & Min* * Mar 29-**90**; Parkinson proc. * Apr 30-**92**; extraction from atmos. *E News* * Apr 12-**90**; Kassner proc., abs. *Inst C E* v 105 -**91** *Genie Civil* 8-**91**; manuf. mechan. appliances, Murray, insets (full) *Inst M E* * Jan -**90**; indus. applics., Thorne *Sc Am Sup* Apr 20, (full) June 1-**89**; active, in vital phenomena, Richardson, Feb 8-**90**; Parkinson's gas proc. * June 11-**92** *Iron*; liquefying, Dewar *The Eng* * June 17-**92**. See also CHEMISTRY, oxygen

Oyster shells anal., L. P. Brown, n *Sc Am Sup* Mar 2-**89** *Am Chem J*

Ozokerite (mineral wax), U. S. produc., Parker *E & Min* Aug 1-**91**; Utah, Seal *F Inst* Nov -**90**

Ozone, hist. synopsis, 1840-92 *El Rev Lond* Jan 22, Feb 12, Mar 18, Sep 16-**92**; Fahrig *Sc Am Sup* Feb 28; formation by combust. and presence in air, Renouf, Apr 19, formation by elec. discharges * 26; industrial elec. ozonization * May 31-**90**; Fahrig's electrostatic manuf. proc. * Sep 24-**92**; *Chem Tr J*, *Am Chem J*

Packing-presses, hydr. (for cotton cloth), Hopkinson *Inst C E* * v 99 -**90**
Paddon, William V. *Inst C E* v 103 -**91**
Pagan, John *Inst C E* v 96 -**89**
Paine, William H. *E News* Jan 10, por. *St R J* * Feb -**91**
Paint, ore mines at Lehigh Gap, Hesse *Am Min* * v 19 -**91**; fireproof *E & Min* June 1-**89**; mineral paints, Kemp, Jan 2-**92**; *E News* Oct 12-**89**; C. B. Dudley (chem. applied to R's) *R & Eng* July-Sep; oils *Sc Am Sup* June 13-**91** *Chem Tr J.* See also OILS, paint
Paint mill *Eng* * Feb 10-**88**
Palenque, the Am. Pompeii *E & Min* Feb 22-**90**
Panorama of Transatlantic Co., Paris exhib. *Eng* * July 5 -**89**
Paper, Paper-making, Text-bk. of, Cross, bk., Spon, Lond. '88; industry, Hobart *E Mag* * Jan; newspaper making from wood, Hanford * Sep -**92**; sulphite fibre or pure wood cellulose manuf., Michaelis *E News* June 29-**89**
Inst C E sizing with rosin, Wyatt * v 91 -**88**; testing of, Haselkoos, abs. v 95 -**89** * *Zap Imp Russ* No 11-**88**; manuf. *Locom* Jan -**89**
Sc Am Sup Esparto (fibre), (full) Oct 5; pulp, iron mordants for toning and dyeing, Dec 7-**89** *Chem Tr J;* det. of wood pulp in *Sc Am Sup* Apr 2; testing, Hertzberg report, Nov 5-**92**; manuf. and uses, Russell *Soc Arts Mass* -**88.** See also LIME sulphite fibre manuf; ROOFING paper (tar) manuf; SULPHITE pulp
Paper bag machine, Paris exhib. *Eng* * May 31, rotary block-bottomed paper, Duerden, discuss., insets *Inst M E* * Oct; Am. *Sc Am Sup* * July 13-**89**; * Feb 7-**91**
Paris, France, st. cleaning, n *E News* Jan 17, Aug 22; rapid transit, the Ladame plan, map * 29; st. cleaning *Sc Am Sup* Sep 5-**91**; fires, see FIRE protection, also BUILDINGS; EXHIBITIONS; PAVEMENTS; RAILROADS; SEWERAGE; STREETS. WATER-works, etc.
Park, Prospect, Brooklyn, De Wolf, insets *E Mag* * Apr -**92**; areas, n *Sci Am Arch Ed* July -**88**
Parker, Francis G. S. *Inst C E* v 100 -**90**
Parker, George C. *Inst C E* v 104 -**91**
Parkes, William *Inst C E* v 96 -**89**
Pasley, Charles (full) *Inst C E* v 103 -**91**

Pasteur, life work of a chemist, Roscoe (full) *Sc Am Sup* Dec 14 -**89**

Pasteurizing ap., Kuhn *Sc Am Sup* * Oct 5-**89**

Patents, new and patented inventions, notes, Richards *Cassier's* * Oct – Dec; influence on Am. industries, Mead, Dec -**92**; pat. law revision, Stewart (full) *El Eng* Jan, C. A. Brown, Feb; U. S. stats., Lockwood, Feb -**88**; a century of pat. laws, Blatchford, Apr 15-**91**

El Rev legislation, N. E. Elec. Light Assoc. discuss. Mar 10 -**88**; Am. system growth, diag. * May 2; Brit. pat. and telegraph stats. June 27-**91**; law and what constitutes an invention, Lowrey (full) Mar 8 *El Wld* Mar 8-**90**; U. S. Commiss. report, Oct 5-**89**, Nov 1-**90**; Am. system, birth and growth, Mitchell, Apr 18-**91**

Eng interdependence of pats., ed. Mar 22-**89**, ed. May 2-**90**; centenary, Wash. June 5-**91**; German law, ed. Mar 4-**92**; see also files; 100 years of, Allison, pors. *E Mag* * June -**91**; Am., limitation of by foreign pats. *E & Min* Feb 16-**89**

E News large decree for violation of, Tilghman glycerine pat. n Mar 31-**88**; business, n Dec 13-**90**; U. S. system, past and present, ed. Apr 18-**91**; claims, Starck *R & Eng* Jan -**88**; centenary of, ed. Apr, May -**91**; for small things (value of) *Sci Am* Nov 17-**88**; system, necessity for, Coale *Sc Am Sup* Mar 10-**88**; laws, a century of, U. S., Blatchford, May 9-**91**; French law *The Eng* Aug 2-**89**; English, value of, ed. Dec 25-**91**. See also ELEC. Co's, Edison incand. pats—lamps—patents; *Eng* and *The Eng* files; INVENTIONS; LOCOMS., compound; U. S. pat. office, etc.

Patten, Francis J., por. *El Eng* Apr 2-**90**

Patterns marking system, Frith *Sc Am Sup* Sep 21-**89**

Paulson, Webster *Inst C E* v 91 -**88**

Pavements and paving, carriageway, ed. *Eng* July 22, 29, Aug 12-**92**; and roads, Love, bk. n *E & Min* July 12-**90** *E Rec;* valuation of road metal and setts for, Stock *E News* Sep 22 *The Eng* Aug 31-**88**; cost of, Howard *E News* Mar 15-**90**; st., Boston, May 12; st., in Am. cities, July 7-**92**

E Rec and st. R's, Stayton, Dec 3-31-**87**, Jan 7, 21, Feb 25, Apr 7, May 26, June 9, 16, Oct 13, Dec 8, 29-**88**, Apr 13, June 8, 15, Aug 3, Sep 14, Oct 5, Dec 7-21-**89**, Jan 4-**90**; st., Collingwood, Mar 7; paving material, Butts, May 2, do., tests, table, Shedd, Sep 26-**91**; st., Haupt *F Inst* Dec -**89**, st., Sargent

Pavements

Sc Am Sup Jan 14-**88**; and paving materials *St R J* July -**90**, * Oct -**92**. See also ASPHALT; MUNIC. eng; ROADS; STREETS and names of cities

ASPHALT, *E News* Jan 21; in Berlin, Hering, Dec 15-**88**; rock asphalt, N. Y. Sep 28; on concrete, N. Y., Nov 16-**89**; in N. Y., Gilroy report, May 5-**92**; Lond. asphalt, cost of maintaining *E Rec* Jan 18-**90**; Wash., D. C., details (full) Feb 14; laying, Berlin, Germany * Dec 19, 26-**91**, Jan 2-**92**. See also ASPHALT

BERLIN, asphalt, Hering *E News* Dec 15-**88**; paving, Dec 13 -**90**

BOSTON, st. *E News* May 12-**92**, specs. *E Rec* July 25, Aug 1 -**91**

BRICK, and brick manuf., Calkins, insets *Am C E* * v 26-**92**; st., Kent *E & Min* June 21-**90**; Billingsly *E News* Feb 2; Ryan, June 15, 29; Hale system of * Aug 3; discuss. Dec 21-**89**; fire-brick, Culley, notes * Mar 1, spec. 8; Nebraska City, spec. Mar 29; tests of, Potter, June 21; bricks and, Chase, July 19 * 26-**90**; tests, Butts * Apr 11-**91**; tests, table *E Rec* May 2-**91**; Burlington, Iowa, spec. Feb 27; fire-clay, Cleveland, O., specs. Apr 16-**92**; st., Sargent, abs. *Inst C E* v 91 -**88** *J Assoc E Socs* -**87**; slag brick paving, Wright *Lehigh Eng J* Feb -**89**. See also BRICK

DETROIT, report *E News* Mar 29-**90**

DULUTH paving imp. and sewerage *E Rec* * June 28-**90**

GRANITE, for st. work, Cen. bull. *E Rec* May 16-**91**; granite block measuring, Jan 16-**92**

HALE, the *E & Min* * Jan 25-**90**; system of brick *E News* * Aug 3-**89**

IRON and oak combination, Cole *Am M E* * v 13 -**92**

KANSAS City, Mo. specs. *E Rec* Aug 29-**91**

LIVERPOOL, England *E Rec* Dec 12-**91**

NEW York city, Broadway, spec. *E Rec* Dec 12-**91**

ST. Louis, Mo., Mackland *E News* Mar 14; *E Rec* Feb 7-**91**

STONE, noiseless, Nicolls *E News* Aug 2; slabs, Hudson river blue stone, Nov 29-**90**

SYDNEY, New So. Wales, paved carriage-ways in, A. Mountain *Inst C E* * v 93 -**88**

TELFORD-Macadam *E News* * Sep 7-**89**

WOOD as material *E News* Sep 8-**92**

Pazzani, Julius *Inst C E* v 95 -**89**
Peach orchard, a Conn., Hale (full) *Sc Am Sup* Sep 27, Oct 4-**90**
Peacock, Richard *Inst C E* v 97 -**89**
Pearce, Richard, por. *E & Min* * Apr 4-**91**
Pearce, William *Eng* Dec 21 *The Eng* Dec 21-**88**
Pearls, chem. constitution, Harley *Sc Am Sup* Sep 15-**88**
Pendulum expts., Foucault's *Sc Am Sup* * Jan 7-**88**
Peninsular & Oriental Steam Nav. Co., ed. *The Eng* Dec 21 -**88**
Penny, Alfred *Inst C E* v 101 -**90,** 107-**92**
Pensions, old age, ed. *Eng* Dec 18-**91**
Percy, John *Inst C E* v 99 -**90**
Perfumes, odors and sense of smell, Henry *Sc Am Sup* Oct 8-**92** *Pop Sci*
Perkins, George L., por. *R Gas* * Aug 3-**88**
Perkins, Loftus *The Eng* May 1 *Inst C E* v 105 -**91**
Perrier, Roland *Inst C E* v 91 -**88**
Perry, John, por. *El Wld* * July 11-**91**
Personal identification and description, Galton, abs. *Sc Am Sup* * Aug 18-**88**
Peru, geol. of the Cerro de Pasco, and notes on topog., Hodges *Am Min* * v 16 -**88** ; Repub. of, Sears *N E Mag* * Dec; commerce and resources, map, Pezet (full) *Sc Am Sup* * May 7, 14; mining indus. Dec 24-**92**
Peters, Edward D., por. *E & Min* * Nov 14-**91**
Peto, Samuel M. *Inst C E* v 99 -**90**
Petroleum, and natural gas in N. Y. state, Ashburner, inset maps (full) *Am Min* * v 16 -**88**; crude as fuel for raising steam at So. Chic. works, Potter, coal vs. oil in puddling furnace, Billings, oil as a metallur. fuel, Felton, v 17, 17-**89**; Racine system of burning crude oil *El Wld* * Apr 6-**89**; Russian transport., ed. *Eng* Jan 20 * Feb 3-**88**; storage, Carrington, Apr 10; as the future fuel of the Pac. Coast, May 22-**91**
E & Min petrol. and its cognates, Hoefer, bk. review, Aug 4 -**88**; market review '87, Jan 7-**88,** Jan 12-**89,** '89, Jan 4-**90,** Jan 3-**91**; origin, Hoefer, May 16; U. S. produc., Weeks, Cen. bull. June 20-**91,** '91 and market review, Jan 2-**92**; burning, Aerated Fuel Co's system *E News* * Nov 30-**89**; oil fuel, Minneap. water-works, July 28-**92**; transport., U. S. *E Rec* July 26-**90**; Russian and Am., Sadtler, map *F Inst* * May -**88**

Petroleum

Inst C E petrol. gas of Trenton limestone, Ohio, Orton, abs. v 104 -**91** *U. S. Geol. Survey* v 2 -**90**; storage installs. at Avonmouth and Cardiff, Pickwell, insets *Inst C E* * v 104 -**91**; reception and storage of refined in bulk, Carrington, discuss., inset (full) * v 105-**91**; as fuel, Bost. & A. R., Springfield, Mass., expts. *Lehigh Eng J* Apr -**88**

Sc Am Sup petrol. launch Zephyr * Aug 18-**88**; (molec. structure of matter) Anderson, Nov 23-**89**; refining and lub. oils, n Aug 15; origin, Ross, Nov 21-**91**; solidification expts., Rideal, Mar 26-**92**; petrol. ships, ed. *The Eng* Oct 26-**88**; liquid fuel ap., Great East. R., Holden's system * May 15-**91**; Root's launch motor * Sep 30-**92**. See also FURNACES, liquid fuel; LOCOMOTIVES, boilers, fire-boxes; WELLS, petrol.

Petroleum engines, W. Robinson *Eng* * Oct 2, 9 *The Eng* * Sep 11, 18-**91**; Unwin, Mar 11 *Eng* Mar 11 Robinson * 11-25, Unwin, discuss., inset (full) *Inst C E* * v 109 -**92**; Durley * v 110 -**92**; 3-cyl., Muller, abs. v 100 -**90** *Genie Civil* * v 16 -**90**; motor *Sc Am Sup* * Sep 27-**90**; spirit engines *The Eng* June 15-**88**

BRAYTON, the *Cassier's* * Aug *Eng* * July 15-**92**

BUTLER'S motor *The Eng* * July 25-**90**

GRIFFIN'S oil engine *The Eng* * Dec 2-**92**

PRIESTMAN'S *Eng* * May 18 *E News* * Nov 17-**88**, Sep 1-**92**; and Hornsby-Akroyd *The Eng* * Sep 25-**91**

SPIEL'S, etc., performance, n *The Eng* Aug 31-**88**

TRUSTY, the, n *Eng* * Dec 2, portable *The Eng* * Dec 9-**92**

YARROW'S *The Eng* * May 25-**88**

Pettit, William *F Inst* Apr -**89**

Phelps, George M., por. *El Eng* * June -**88**

Philadelphia, map *Eng* * Mar 9, 16-**88**; mayor's message, Fitler *E News* Oct 12-**89**; pub. works, Aug 2-**90**; st. cleaning '91, n Nov 10; as a seaport, Mahan *E Rec* Apr 23, 30 *F Inst* Mar, Apr; port of, Haupt, Jan -**92**. See also FIRE protection, Phila. fires; MUNIC. eng; PAVEMENTS: SEWERAGE: STREETS; WATER-works, etc.

Philbrick, Edward S. *E Rec* Feb 23-**89**

Phillips, Alfred *Inst C E* v 97 -**89**

Phipps, George H. *Inst C E* v 96 -**89**

Phipson, Wilson W. *Inst C E* v 108 -**92**

Phonograph, the new talking machines, Edison's, Hubert *Atlan M* Feb -**89**; graphophone, Tainter *El Rev Lond* * Aug 3 *El Wld* May 19 (full) * July 14; Gilliland * May 19 *El Rev* * May 19, Edison, June 16 *No Am Review* June -**88**; and micrographophone, Bleyer *El Rev* * May 23-**91**

El Wld gramophone records, Houston, July 14, Berliner's * Aug 18; some possible forms, O. Smith * Sep 8, Hunter, n 22 -**88**; Bettini's micro-graphophone * Apr 26-**90**; Edison's, ed. *Eng* Aug 17 * Sep 14, 14-**88**; expt. * Mar 15-**89**; phonos. and graphophones (full) *E & Min* * Sep 15-**88**

Sc Am Sup Edison's new * Feb 11; and graphophone (full) * Oct 27-**88**; Edison's * July 13-**89**, Johnson, Mar 29-**90**; Larranaga's photo-phon., Maier * Feb 6-**92**; and phon.-graphophone, Vaughan *Soc Arts Mass* -**89**. See also GRAMOPHONE; GRAPHOPHONE

Phosphates, slag, Phillips *Am Min* v 17-**89**; commercial, list of, Adams, v 18-**90**; indus., n *E Mag* Aug *E News* July 18-**91**, of Fla., Wilson, insets *E Mag* * Oct -**92**, do. beds, Ledoux *E & Min* Feb 8, notes, Wyatt, Aug 23-**90**; So. Car. phos. rock market '90, Jan 3; deposits, Fla., notes on geol. of, Darton, Feb 14, do. origin and deposition, Davidson, May 30; of Am., Wyatt, bk. review, Nov 14; Fla. fields, notes, Adams, 21, 28, Dec 5, 12-**91**, do. U. S. produc. '91, Jan 2; Fla., mining, do. * 23 * Feb 13, Pratt, Apr 2; So. Car., mining, Benedict * Mar 26; beds of Maltese Islands, Cooke * Aug 27-**92**

E News indus., n July 18; phosphate of lime produc. July 11 -25-**91**; report, Terne *F Inst* Dec -**92**; beds of Fla., Ledoux *Sc Am Sup* July 12-**90**, deposits, Darton, Mar 14, origin and dep., Davidson, July 25-**91**; So. Car., mining, washing and calcining, Benedict, Apr 16; Fla., Pratt, 30-**92**

Phosphorus, rapid method of det. in ores, Woodbridge *Am Min* v 17-**89**; in pig-iron, steel and iron-ore, C. Jones, in cast iron, Keep, distrib. in Hudson river carbonates, Olmsted * v 18, 18-**90**; the glow of, Thorpe *Sc Am Sup* Aug 9-**90**; manuf. by electricity, Readman-Parker proc. Oct 3-**91** *Chem Tr J*

Photography, of coal mine interior, Dewey, insets *Am Min* * v 16 -**88**; applics. to sci. purposes, Wood *Eng* Mar 30; stereoscopic, Stroh * May 4-**88**; prog., Abney, Oct 4-**89**

F Inst recent advances in, Ives, May; chlorophyl and gelatine-bromide plates, do. * June; substitute for glass, Carbutt, Dec -**88**; heliochromy, Ives, Jan, n Nov; amateur, in its educa-

Photography

tional relations, Himes, May; substitution of gelatine for collodion, com. report, Sep; lenses, focus of, Cheyney * Nov -**89** * June; proc. without metallic salts, Dec -**90**

F Inst in the colors of nature, Ives, Jan; heliochromy, Prof. Lippimann's, do. Aug -**91**; *Locom* Sep -**89**; in natural colors, Feb -**90**; surfaces feebly sensitive to light, Osborne *Sci Am* Jan 19-**89**

Sc Am Sup platinotype proc., Gunther, Jan 21, Willis, May 12; gold and silver salts making, camera, Feb 4; plates, flex. substitutes for * May 5, manuf. * 26 * June 9; stereoscopic * 9; stellar, Holden, July 28; transferring and coloring, on glass, Ashman, Aug 4; negatives, Rau, 11; notes, Sep 8; instantaneous, Howland, Oct 6; notes, 6, 13, objectives, Bausch, Nov 3, 10, Dec 8; printing plates, Nov 17-**88**

Sc Am Sup engraving on glass, Duchochois, Jan 26; the inventors of * Feb 16; lenses, Beck * Mar 30; the law and, Cooper, Apr 20; making dry plate emulsions, Lyon, May 4; orthochromatic, Litzkow, Aug 17; aut. ap. * Dec 21; heliochromy (colored pictures), Oct 5, Ives n *F Inst* Nov -**89**

Sc Am Sup pictures distorting, Wallace, Mar 1; platinotype printing, Mar 1; composite, Batut * Apr 5; a new photographic eye, Flammarion, May 3; ap., Lick observ., Holden * Aug 16; image, Meldola, Sep 13; the Primuline printing proc. Dec 20 -**90**

Sc Am Sup tele-photog. (elec. transmiss. of pictures), Sutton * Jan 24; in colors of nature, Ives * Mar 14; in aniline colors, Green, May 2; aut., Enjalbert ap. * 30; work of Herschel and Fox Talbot, Lang, Aug 15; postage stamp photos. * 15; printing processes, Bothamley, 15; applics. of, Rayleigh * 29; upon a black background * Oct 24, 31; photographic chemistry, Meldola (full) Oct 24, 31, Nov 7; kite * Nov 7-**91**

Sc Am Sup telescope lens, Dallmeyer * Apr 9; notes * May 7; composite heliochromy, Ives (full) July 2; photos. untrustworthiness * Dec 17-**92**; of solar prominences, Hale *Tech Q* Nov -**90**

The Eng Crystal Pal. exhib. Mar 2, 9-**88** * Apr 5, 19 * May 10-**89**; Marion & Co's works, Apr 20, May 4; Swain's photozincographic works, June 8-**88**; B. Edwards & Co's photographic dry plate works * Mar 8-**89**; in natural colors, May 29, June 12; illum. of developing rooms, Aug 14; recent aids

Photography
to science, Sep 18, Oct 9-**91**; Camera Club conference * Mar 25; photos. (distortion) * Nov 4; curious phenomena and applics. Dec 16-**92**. See also CHRONOPHOTOGRAPHY
KINETOGRAPH, the Edison *El Eng* * June 24-**91**, Lathrop *Harper's W*
Photo-etching, intaglio plates, method *Sc Am Sup* Dec 28-**89**; on copper plates, Nov 1-**90**
Photogrammetry *Sc Am Sup* * June 15-**89**
Photo-intaglio proc., Levy, inset *F Inst* * Nov -**92**. See also PHOTO-etching
Photo-lithographic transfers, Wilkinson *Sc Am Sup* May 11 -**89**
Photo-mechan. processes, Koehler (full) *Tech Q* Oct -**92**; Waterlon's mechan. works *The Eng* Oct 5, 5, 19-**88**
Photo-micrography, imps. in, Zeiss ap. *E News* * Jan 2-**92**; Pringle *Sc Am Sup* Oct 4-**90**
Physicians to Crown Prince of Germany, pors. *Sc Am Sup* * Feb 4-**88**
Physical, National laboratory, Webster *El Wld* Aug 6-**92**; ap., economical, Ince *Sc Am Sup* * Dec 13-**90**; science. See also GRAVITATION; MOUNTAINS; OCEAN; SCIENCE
Physics, Elements of (dynamics), Fessenden, bk., Macmillan, Lond. '92; precision of measurements, Holman, discuss. *Tech Q* Dec -**87** * May, (very full) *El Eng* Feb, May, July, Sep -**88**; law of inverse square, Wolcott, Nov -**89**; Physical Soc., flow in a strained elastic solid, C. Wilson *Eng* * May 16-**90**; pendulum measurements *Locom* Jan -**90**; absolute zero, Aug -**92**
Pwr what is a vacuum * Dec -**89**; stresses produced by sudden forces and shocks, Merriman *R & Eng* Dec -**89**; instability of solids, ed. May -**90**; expts. in, Hopkins *Sci Am* Feb 2-**89**; superficial tension expts. *Sc Am Sup* * Sep 8-**88**; Van 'T Hoff's law of osmotic pressure, Carnegie * May 16-**91**; expts. upon surface films, Rayleigh * June 11-**92**; regulator for maintaining constant exhaustion (gases in capillary tubes), Holman *Tech Q* * Sep -**87**
Physiography, diametral, Kalakaua *Eng* * Feb 24-**88**
Physiology of good and evil, Richardson *Sc Am Sup* Dec 14 -**89**
Piercy, Benjamin *Inst C E* v 96 -**89**

Piers, iron coal-pier, Norfolk & West. R., Va., Coe, *E Rec* * Oct 29, discuss., insets; iron wharf, Fort Munroe, Va., Duncklee, discuss., insets *Am C E* * v 27, 27 -**92** *E News* June 30; new, Southampton, Lemon *Eng* * Sep 2-**92**; pier head at Marine Park, Boston *E Rec* * Sept 21-**89**; on soft ground Ripley * Mar 29-**90**; iron ice pier, Newcastle, Del. * Apr 23-**92**

Inst C E compressed air foundations, Rochelle, La Pallice har., Thurninger, abs. v 100 -**90** *An Ponts* * Nov -**89**; No. and W. coast, Scot., Barron, inset *Inst C E* * v 99 -**90**; subaqueous part of, method of construct., Kidd * v 105 -**91**; and pile abutments, Jameson *R & Eng* * Feb -**90**; promenade pier, St. Leonards-on-sea *Sc Am Sup* * June 23 *The Eng* May 11, 11-**88**; at Brighton * Jan 29 * Feb 12, old chain pier * Mar 4-**92**. See also BRIDGES; HARBOR eng; PILES; TRESTLES

Pig-iron. See IRON, pig-iron

Pile-driving, uniform practice in, Crowell *E News* Dec 29-**88**, (full) * Oct 27, Nov 3, 17, discuss., inset (full) *Am C E* * v 27, 27 -**92**; factors of safety *E News* Dec 29-**88**, ed. Apr 6; formulas, Trautwine, cor. Mar 16, May 11; South st. bridge, Phila. * Oct 19, 19; cost of, Baker, Dec 14-**89**

E News and ditching plant, Om. & St. L. R., inset * Aug 16 -**90**; formulas, Husten, cor. and ed. Aug 25; safe load for piles, ed. Nov 17; pile-driving experience, Howe cor. Dec 8-**92**

E Rec pile driver and adjustable derrick * Nov 9-**89**, revolving hydr. * Apr 4; driving, Adams, July 25; a pendulum pile driver * Dec 5-**91**; driving, Jameson *R & Eng* Oct -**89**; triple row driver *The Eng* * May 8-**91**

Piles, allowable load on, Haagsma, cor. *Eng* May 6; pile and trestle timber structures, Western Am. R's, inset * 20-**92**; safe bearing load, formulas, Trautwine, cor. and ed. *E News* Dec 29-**88**, Jan 19-**89**; sinking, jet and screen dike, Missouri river com. * Dec 6-**90**

E Rec pile bridges cost of repairs, Talbot Sep 20-**90**; abutments and piers, Jameson *R & Eng* * Feb; preservation, Mc Intosh, June -**90**; safety of pile bridges *R Gaz* Apr 26-**89**, and trestle, Minneap. & St. Louis, Hixon, cor. * Apr 17, deep water R., Halifax har. * Dec 25-**91**; protection (cost), Pritchard *Sc Am Sup* Mar 1-**90**. See also BRIDGES; BUILDINGS; FOUNDATIONS; HARBOR eng; PIERS; TRESTLES

Piling, sheet, clamp for, Emery, inset *Am C E* * v 20 -**89**; Wakefield's sheet *E News* Mar 1, Harris cor. * 22-**90**

Piles, SCREW piles, in Germany *E News* * May 26; for bridge piers, Spring * Aug 4, cyl. pier sinking * Sep 8-**92**

Pill-picker machine *The Eng* * May 24-**89**

Pilot chart of No. Atlantic ocean, Hayden, map *F Inst* * Apr * June -**88**

Pinchin, Robert *Inst C E* v 95 -**89**

Pins, fibre stain in, J. B. Johnson *E News* * Jan 28, Du Bois, cor. Mar 10; strains in, Fowler, cor. * 24; and eye-bar proportions, Stowell, 31-**88**

Pipe-joints, steel, for spiral weld *E News* * May 31; lead, calking, Aug 30; Holmes' flexible * Nov 22-**90**; the Fenney cutting machine * Feb 21-**91**; cast iron water pipe cement joints, May 5 * Sep 8-**92**

Pipes, securing brass flanges to copper, Nagle *Am M E* v 9 -**88**; equation of, table *Cassier's* Nov -**91**; fittings moulding in U. S., Forbes *Eng* * July 20-**88**; water flowage in, Airy * Jan 4, 11; air vessels on, M'Creath * July 5-**89**; Pott's labor-saving fittings *E & Min* * Mar 7-**91**

E News and pipe flanges dimens., Codman * Jan 12-**89**; computations, Cox, diag. * Dec 22; measurement vel. of air in, Donkin, 22 *Inst C E;* hot water, india rubber, durability, Belleroche, abs. v 110 -**92** *Rev Mines* v 18 -**92**; cast iron, indus. in U. S. *E Rec* Mar 26; steel, specs. Dec 24-**92**; wrt. iron and boiler tubes, dimens., table, Morris, Tasker & Co. *Locom* Jan-**89**. See also GAS — SEWER — WATER pipes, etc.

Pittsburg, stats., Ricketson *Am Min* v 19 -**91**; *Eng* Oct 24 -**90**

Pivot bearing (footstep), friction, expts., report *Eng* Mar 27 * Apr 17-**91**

Planimeter, polar, novel applic., Emery, inset *Am C E* * v 18-**88**; polar, Gieseler *Sc Am Sup* * Mar 17; spherical, H. Shaw * Nov 3-**88**

Planing machines, plate edge, Forth bridge works *Eng* * Dec 14 -**88**; Sellers', Paris exhib. * Mar 14-**90**; double-acting tool rest *The Eng* Nov 9-**88**

Plante, Gaston, pors. *El Wld* * June 22 *E & Min* * 29 *Sc Am Sup* * July 13-**89**

Plants evolution, Coulter *Sc Am Sup* * June 16-**88**

Plaster of Paris manuf. and use *Sc Am Sup* Mar 21-**91** *Chem Tr J*

Platinum, electro-dep., Wahl *El Eng* July 16 *El Rev Lond* July 11 *El Wld* June 28 *F Inst* July, (full) *Sc Am Sup* Nov 22 *E & Min* June 21-**90**; metals (full) June 29-**89**; n Nov 29-**90**, Jan 3-**91**; *E News* Dec 20-**90**; and gold indus. of the Ural, Laurent, abs. *Inst C E* v 105 -**91** *An Mines* v 18-**90**; *Sc Am Sup* Nov 23-**89**; prep. and es. of pure, Mylins, Oct 29-**92**

Playing cards manuf., Chilon (full) *Sc Am Sup* June 29-**89**

Plumbing *E Rec* * Feb 4, 18 * June 9, 16; N. J. law, July 7 * 14, N. Y. specs. 21, Toronto, 28; Sep 1, 29, Nov 24-**88**; Boston Custom-house, May, June; Chic. regulations, Oct 26; N. Y. Cty. Court-house * Dec 21-**89**; Turn Verein building, N. Y. * Feb 8, 15; and drainage specs., N. Y. city, Apr 19, 26, May 3, 10; Boston law, June 21-**90**; St. Louis, Mo. inspection, Apr 4; Madison Sq. Garden, N. Y. * 11; Birm., Ala., practice (rules) * June 13; in 72d st. houses, N. Y. * Nov 14-**91**; Chic. ordinance, Feb 13; Fifth Ave. theatre, N. Y. * July-Sep; Suffolk Cty. Court-house * Sep, Oct -**92**

Pneumatic, hoisting, Wheeler *Am Min* * v 19 -**91**; dispatch, Wildemann system *Eng* * Nov 13-**91**; tool, MacCoy's, com. report *F Inst* July -**89**; pumping ap. *Iron Age* * Dec 8; dispatch improvements *Sc Am Sup* * Feb 27-**92** *Eng;* tubes, Postal telegraph system, Great Brit. *The Eng* * Dec 18-**91**

Pneumonia, M. Smith *Sc Am Sup* Dec 1-**88**

Pole road locomotives *E News* Mar 2-**89**

Police signalling, Morgan's aut. elec. system, Hill *El Rev Lond* * Mar 7-**90**

Pollard, Thomas S. *Inst C E* v 99 -**90**

Polygons, regular, graph. construct., Weihe *Lehigh Eng J* Feb -**89**

Pompeiian house of Pansa, restoration *Sc Am Sup* * Nov 8 -**90**

Population, the world's, n Eng p 458, Oct 16-**91**; finding the center of, n *E News* June 15-**89**. See also under names of countries, cities and places

Porcelain, manuf. in France *Eng* * Jan 17, 24 * Feb 7, 21 *Sc Am Sup* * Mar 22, 29-**90**; English china, Bayley, abs. Apr 7; manuf. possibilities, Elbers *E & Min* Feb 25-**88**

Portable engines and boilers. See BOILERS — ENGINES, portable

Porter, John A. por. *E & Min* * Sep 26-**91**

Post, penny, jubilee, ed. *Eng* May 23-**90**

Postal telegraph, Great Brit. (full) *The Eng* * Dec 18-**91**

Posts, yellow pine, new formula for, proposed, Stanwood *Tech Q* Apr -**92.** See also COLUMNS

Posture and its indications, Lander-Brunton *Sc Am Sup* * Aug 13-**92**

Potash, report, Payne *F Inst* Dec -**92**; yellow prussiate *Sc Am Sup* Aug 11-**88.** See also CHEMISTRY, potash

Potter, William A. *Inst C E* v 91 -**88**

Potts Arthur *Inst C E* v 96 -**89**

Potts, Frederick A., por. n *E & Min* * Nov 17-**88**

Powder. See EXPLOSIVES, cake — gun powder

Powell, John W., por. *E & Min* Jan 30-**92**

Power, measurement of, Gray *Am M E* * v 13 -**92**; hot air and steam for *Cassier's* Nov -**91**; large units, economic limit of *Eng* Dec 4-**91**; supply at Liverpool, Feb 12-**92**; plants for hydr. *E News* Aug 23-**90**; river Rhone, util. of motive power at Geneva, Powles, inset *Inst C E* * v 96 -**89.** See also DYNAMOS; ELEC. motors — power transmiss; HYDRAULIC; NIAGARA Falls util; POWER transmission; RAILROADS, elec. power stations

Power meter *El Rev Lond* * July 22-**92**; and indic., Waite *El Wld* * Mar 15-**90**

Power transmission, Hering *Cassier's* Apr; rope drive for, Grimshaw * July; variable speed, Spaulding *El Rev* * Dec 24-**92**; by water and air, Donaldson *Eng* Mar 16, Hanssen, cor. Apr 27, May 11, 18-**88**; pneu. distrib., Lupton, Sep 12-**90**; elec Feb 20, 27, Kapp, Mar 6, and hydr., Blaine, May 22, June 5 Shaw's transmitter * Dec 25-**91**

E News util. of Niagara n Nov 29-**90**; Hering, Mar 19 *Pwr* Apr -**92**; elec., Sprague *F Inst* * Mar * Apr -**89**; to great distances by compressed air, Unwin *Inst C E* * v 93 -**88**; rope *Sc Am Sup* * Mar 24-**88**; by manila ropes, Gregg * May 24; Shaw's coil friction transmitter * 31 *The Eng* * Apr 18; *J Assoc E Socs;* rope for *St R J* * Apr * Sep -**90.** See also BELTING; COMPRESSED air; DYNAMOS; ELEC. motors — power transmiss; HYDRAULIC; RAILROADS, elec. power stations; ROPE driving; WIRE rope

Precious stones, produc. '91, Kunz *E & Min* Jan 2-**92**; Kunz *F Inst* Sep, Oct -**90**; and diamond cutting, do. *Sc Am Sup* July 11-**91**; in last decade, do. (full) *Soc Arts Mass* -**88**

Preservaline, for meat, Terne *Sc Am Sup* Feb 6-**92** *F Inst*

Presses, power press problems, O. Smith *Am M E* v 9 -**88**; foot press, n *Eng* * Mar 13-**91**; drop, foundations for, Gorham Mfg. Co., Prov., R. I. *E News* * Feb 22-**90**. See also FORGING — PACKING — PRINTING presses

Pressure gauges, for high pressure gases, Budenberg *Eng* * Jan 29-**92**; open mercury column for high pressures, Bird *E News* * July 19-**90**; mercurial, on Eiffel tower *E Rec* May 23-**91**

Prices, regulation, legal theories of, Hadley *R Gas* Aug 12-**92**. See also FOOD; LABOR and names of articles

Priestley, Joseph, por. (full) *Sc Am Sup* * May 4-**89**

Prime, Charles *Inst C E* v 102 -**90**

Prime movers. use of spirit in, Yarrow *The Eng* * May 31, ed. June 21; the Cardium (nature of), Gamgee * Oct 18, Nov 1-**89**. See also ENGINES; HOT air engines; LOCOMOTIVES; TIDE motors: WINDMILLS

Printing, or relief plates making, Joyce proc., Hoke or Star proc. and Hanson proc. *Sc Am Sup* Oct 19-**89**

Printing machine, the electro-matrix *E News* Apr 13-**89**. See also TYPE-setting machines

Prison reform, Canonico *Sc Am Sup* Sep 3-**92**; Wayland *Soc Arts Mass* -**89**

Prjevalsky, N. M. (explorer-Asia) (full) *Sc Am Sup* Feb 23-**89**

Professions, the, shall they be regulated, Shaler *E Mag* Oct -**92**

Professors, private practice by, ed. *Eng* Oct 23-**91**

Progress, vibratory law of, Hovey *Sc Am Sup* Dec 22-**88**

Projectiles, elec. welded, Maxim *Cassier's* * Oct -**92**; vel. of, Holden *Eng* Oct 23-**91**; Justin projectile, expts. *E News* * Aug 4-**92**; path of, Gilman *F Inst* Oct, Ingalls, cor. Nov -**91**; forged steel, manuf., Carnegie, abs. *Inst C E* v 110 -**92**; Krupp's and plates expts. at Meppen *Sc Am Sup* * Sep 8-**88**, do. and Brit. steel-faced plates *The Eng* July 13-**88**. See also GUNNERY and armor

Propeller, the jet *Sc Am Sup* Nov 15-**90**. See also SCREW propellers

Providence, R. I., Brown University *Eng* * Sep 11-**91**

Psychical research, Savage *Arena* Nov, (how we feel when we die) *Rev of Revs* Sep; Psychology, internat. Congress *Sc Am Sup* Dec 24-**92**

Public works, National, cor. *F Inst* Sep -**88**

Pulley block Weston's triplex spur gear, Yale & Towne Co. *Eng* * Aug 22 *E News* * July 26-**90**

Pulleys, cone and step, method of finding diams., C. A. Smith *Am M E* * v 10 -**89**; wood (various) *Pwr* * Mar; size and speed * Oct -**92.** See also BELTING

Pullman, Ill. *Eng* Oct 31-**90**

Pulsometer, test of a, De V. Wood *Am M E* v 13 -**92** *E Rec* Nov 21 *The Eng* Dec 25 *E News* Nov 21; Mashin's aut. steam vac. * Apr 4-**91**; De V. Wood *Sc Am Sup* June 29, improvements * Sep 14-**89.** See also PUMPS

Pulverizers, Buchanan's Granulator *E & Min* * Jan 17-**91**; Am Ball * Sep 24-**92**; the Ball mill *The Eng* * Sep. 26-**90.** See also DISINTEGRATORS; GRINDING; MILL, the Sturtevant

Pumping engines, Cornish or double beat pump valves, Nagle *Am M E* * v 10 -**89**; new type, Laval *Cassier's* * Sep -**92**; trip-expan., Mildura Irrig. Co., inset *Eng* * Jan 18; machinery, Paris exhib., Hanarte system * July 26-**89**

E News proposals, table, Feb 4-**88**; compound, power of, tables, Hill, Apr 27-**89**; machinery in the Fenland and by the Trentside, Gibbs, inset *Inst C E* * v 94; underground, Bernissart coll., Ledent, abs. v 94 -**88,** do. high-lift, Vanhassel, etc., abs. v 107 -**92** *Rev Mines* v 2 -**88,** v 15 -**91**; machinery, ancient and mod., Holloway *Sc Am Sup* June 29-**89**; compound differential, Bradley, inset *The Eng* * July 23-**91**

BOSTON, high-duty, relative econ., ed. and cor. inset *E News* * Dec 22, 22, Leavitt *E Rec* * June 4-**92**

BOURNMOUTH water-works, Worthington *The Eng* * Jan 4-**89**

BROOKLYN, N. Y., water-works, of 1860, hist., McElroy *Am M E* v 13 -**92**; 48-in. check valve *E News* * Oct 24-**91**; Milburn station, trip-expan., inset * Mar 12-**92**

CHICAGO, Ill., West Side station, test of Indiana block coal, Nagle *Am M E* v 13 -**92**; tests *E News* Jan 31; trip-expan., inset * May 31-**90**

CORNISH, 'Davey' *Cassier's* * Dec -**91**

CROYDEN water-works, compound, inset *The Eng* * Aug 29-**90**

DAVEY'S differential, n *The Eng* Jan 13-**88**

EATON water-works *The Eng* * Dec 30-**92**

ELECTRIC machinery, Wheeler *Cassier's* * Nov -**91**; in mines *E & Min* * June 15-**89,** coal mines *R & Eng* Mar -**88**

HAMPTON, Davey's compensating lever at *Eng* * Apr 22-**92**

HARTLEPOOL Gas & Water Co., compound condens. *The Eng* Dec 21, 21-**88**

HYDRAULIC, Pearsall *E Rec* * Sep 26 *Inst C E* * v 106 -**91**

Pumping engines, LONDON, East, water-works trip-expan., inset *Eng* * Aug 8-**90**
LUTON, sewage at, inset *Eng* * Mar 29-**89**
MECHALKONITZ, Moravia, underground at, Sauer, abs. *Inst C E* v 92 -**88**
MEMPHIS, Tenn., Worthington high-duty *Eng* * Feb 12-**92** *E News* * Aug 17-**89**, tests * Sep 12-**91**
MONTREAL water-works, cost of pumping '89 *E News* Dec 6-**90**
PAWTUCKET, influence of steam jackets on, Denton *Am M E* * v 11 -**90**, Kent, v 13 -**92**
PETERSHAFT underground, inset *Eng* * Oct 19-**88**
RHYMNEY iron mines, inset *The Eng* * Sep 19-**90**
SCREW, Milwaukee flushing tunnel *E News* * Mar 8-**90**
TRIALS, duty trials of, Coon *Am M E* v 9 -**88**, standard method, com. report, discuss. v 11, 11-**90** *E Rec* May 24, 31-**90**; Worthington, performance against a head equiv. to 2,000 ft. of water, Denton *Am M E* * v 12 -**91**; Chic. West side station, test of Indiana block coal, Nagle; pump test receiving water under pressure, Norris * v 13, 13 -**92** *Iron Age* * Dec 8-**92**; Worthington high duty, Unwin report *Pwr* * Jan -**89** *Eng* * Dec 7-**88**; duty, Barrus, Feb 8, 15, Mar 1-**89** *The Eng* Feb 21-**90** *E News* Gaskill-Holly, duty and capac. test, report * Feb 18; duty trials of, May 25, June 9-**88**; Barrus, Jan 19, 26, abs. *Inst C E* v 98 -**89** *J Assoc E Socs*; performance of best mod. vs. Cornish of 1840, Denton *E News* Dec 28-**89** * Jan 4, 18, 25, Feb 1, 8, 22; Chic. West Side tests, Jan 31-**90**; Worthington high duty tests, Memphis, Tenn. * Aug 17-**89** * Sep 12-**91**, do. tests, Lowell, Mass., Barrus * Feb 20 * Apr 16 *E Rec* Apr 9-**92** *E Rec* Worthington high duty, at Hampton, England, Unwin, Dec 22, 29 *The Eng* Dec 7, 14-**88**; Addington station, effic. *The Eng* * Aug 29-**90**. See also ENGINES, tests and trials
UXBRIDGE water-works *The Eng* * Feb 12-**92**
WESTON-super-mare, differential compensating *The Eng* Jan 13 -**88**
WHEELOCK, for Eiffel tower lifts *The Eng* * Mar 7-**90**
WILLAN'S central valve trip-expan. sewage *E News* * Mar 9-**89**
WORTHINGTON, W. Middlesex water-works *Eng* * Jan 4; high duty *E News* * Aug 17, attachment * 31; Bournmouth water-works *The Eng* * Jan 4-**89**; Oxford water-works, high duty compound * Feb 27 * Mar 6, 6, 13, 27-**91**. See also PUMPING engines trials, Worthington

Pumping stations, equip., Rafter *E Mag* Nov -**91**; designs *E Rec* * Mar 15–29 * Apr 5–26, May -**90**; movable plant, St. Louis * Feb 27-**92**; at Jürgensfeld, Tolle, abs. *Inst C E* v 92 -**88**; at Bercy, Paris, Avdra, abs. v 100 -**90** *Genie Civil* * v 16 -**90**, Paris and reservoirs, Bechmann, abs. *Inst C E* v 105-**91** *An Ponts* Feb -**91**; Agra water-works *The Eng* * Jan 16-**91**

Pumps, AIR vessels on pipes and, M'Creath *Eng* * July 5-**89**, Baird, July 5-**91**

CENTRIFUGAL, effics., Webber *Am M E* * v 9 -**88**; German Admiralty expts. *Eng* Feb 22-**89**; inventor of, Hodgkin * Dec 5-**90**; effic. of, Sterk report, Dec 11-**91**; J. Richards *E News* * Jan 31-**91**; and piston, comparative trials, Glehn, abs. *Inst C E* v 96 -**89** *Bul Soc Mul* -**88**; with cir. ejector, Lavergne, abs. *Inst C E* v 107 -**92** *Genie Civil* * v 19 -**91**; Williams' machinery *The Eng* Oct 26-**88**

DONKEY, Weir's, S. S. Normannia *Eng* * Sep 26-**90**

DOW'S positive piston and difficulties in op. pumps *F Inst* * Sep -**89** *R & Eng* * Dec -**88**

HALL duplex *E News* * Mar 3-**88**

HYDRAULIC, compound plunger, Woakes *Am Min* * v 20 -**92**; duplex compound, Buf. Steam P. Co. *E News* * Dec 13-**90**; Roux's, abs. *Inst C E* v 94 -**88** *Bul Soc Encour* -**88**. See also HYDRAULIC pumps

MASLIN'S aut. steam vac. (pulsometer) *E & Min* * Dec 20-**90** *E News* * Apr 4-**91**

POHLE'S pump air-lift, Stetefeldt *E & Min* * Dec 28-**89**

PULSOMETER, test of, De V. Wood *Am M E* v 13 -**92** *E News* Nov 21 *E Rec* Nov 21 *The Eng* Dec 25-**91** *Sc Am Sup* June 29, imps. * Sep 14-**89**. See also PULSOMETER PUMPS, Maslin's

ROTARY, Johnson's *The Eng* * July 3, boiler feeder * Dec 25-**91**. See also ROTARY pumps

TESTS, centrif., effics., Webber *Am M E* * v 9-**88**; pulsometer, Wood, v 13 -**92** *E News* Nov 21 *E Rec* Nov 21 *The Eng* Dec 25-**91**; centrif., German expts. *Eng* Feb 22; Aug 9-**89**; centrif., effic., Sterk report, Dec 11; testing weir, Prov. water-works *E Rec* * Oct 17-**91**; effic. of, expts., Isherwood *F Inst* * Oct -**89**; centrif. and piston, compar. trials, Glehn, abs. *Inst C E* v 96 -**89**; water-pumps, expts. at N. Y., effic., Isherwood, bk. review, abs. v 99 -**90**. See also PUMPING engines trials

VACUUM, Berrenberg's incand. lamp *El Wld* * Apr 26-**90**; Nicol's shortened Sprengel *Eng* * Feb 10-**88**

Pumps, VALVES, divergencies in flange diams., Sanguinetti *Am M E* * v 9-**88**; Cornish or double-beat, Nagle *Eng** Dec 6-**89** WARD'S *The Eng* Mar 16-**88**. See also ELEC. — vac. pumps

Purden, Wellington (full) *Inst C E* v 97 -**89**

Pyrometers, air, Wiborgh *Sc Am Sup* * Nov 24 *Eng* * Sep 28-**88**; platinum, Callendar, June 17-**92**; and data, Howe *E & Min* * June 7, 14 * Oct 11-**90**; Saintignon's differential *Sc Am Sup* *Apr 19-**90** *Genie Civil.* See also TELESCOPE, pyrometric.

Quarantine system of La., Holt *Sc Am Sup* * Jan 7 * Feb 4 -**88**

Quarries, Box and Corsham, Bath *The Eng* Sep 28-**88**. See also BLUESTONE; BUILDING stones, Great Brit; GRANITE — SLATE — STONE quarries

Quarrying, mod. methods, Saunders *Cassier's* * Sep -**92** *Am C E, E News* * Nov 14 *Sc Am Sup* * Dec 12 *E Mag* * Apr; marble, U. S., Morse, Oct -**91**; and stone cutting mechanism *E & Min* Apr 6 * May 25-**89**; granite cutting and polishing, Day, May 9; bluestone, U. S., Day, Cen. bull. June 6-**91**

E News new bar channeler machine * Apr 13; a big quarry blast, So. Beth., N. Y. * Sep 21-**89**; granite, Cen. bull. *E Rec* Apr 18-**91**; proc. of blasting dimension stone, Saunders * Feb 20-**92**; mechan. and stone cutting *Sc Am Sup* * June 29-**89**; granite *St R J* * Oct -**92**; Belgian machinery, Paris exhib., Traigneaux q *The Eng* * May 10-**89**. See also EXPLOSIVES; GRANITE; MINING; STONE cutting; TUNNELING

Quartz fibres, Boys *Sc Am Sup* * Sep 28-**89**, (full) Apr 4-**91**; the Huntington mill *Eng* * Oct 10-**90**

Quartzites and siliceous concretions, Crosby *Sc Am Sup* July 21-**88**

Quatrefages, A. De., por. *Sc Am Sup* * Mar 19-**92**

Quebec, eastern, mining industries, Ells *Am Min* v 18-**90**

Quicksand, R. L. Harris' new proc. for dealing with *E News* * Apr 28-**92**; action of quicksands, Airy *Inst C E* * v 101 -**90**

Quicksilver, produc. and trade '87, Randol *E & Min* Feb 11-**88**, in '88, do. Mar 2; mines, New Almaden, Cal., inset * Jan 5; in Russia, Abegg, July 13; furnace, El Powenir, Spain * Nov 16; mining, 30-**89**; mines, Cal. produc. Jan 4; deposits of So. Pac. coast, Feb 1; mining Co. report, 1871-90, Mar 14; mines and reduction works, Randol, Sep 6-**90**; stats. Jan 3-**91**; produc., Randol, Jan 2-**92**. See also MERCURY

Rabies, Huidekoper (full) *Sc Am Sup* Apr 13-**89**; and preventive treatment, Ruffer, Feb 22, Mar 1-**90**

Race tracks, laying out kite-shaped, Davison *E News* * June 23; race course construct., Krause *Sc Am Sup* * June 25-**92,** a theatrical, Varietes, Paris *The Eng* * May 29-**91**

Rack and pinion, spiral coil, Quackenboss' *E News* * July 18 -**91**

Radcliffe, John A. *Inst C E* v 104 -**91**

Radiometry, expts. in, Bennett *El Rev Lond* * Aug 8-**90**

Rae, Frank B., por. *El Eng* * Mar 18-**91**

Rag boiler explosion near Stockport *Eng* * Mar 16-**88**; indus. *Sc Am Sup* Sep 5-**91**

Railroading, fifty years ago, early, in New England, Nott *Locom* Jan, June, Nov -**88**

Railroads, availability of Col. cañons for, Stanton, discuss., insets (full) *Am C E* * v 26, emergencies, Bolton, discuss. v * 27 -**92**; op. expenses, Am. and English compared, Dorsey, v 20-**89** *Sc Am Sup* Nov 9 *The Eng* Sep 27-**89,** Am. and Brit. results, ed. *Eng* Apr 29-**92**; No. Am. trans-continental, ed. July 6, 20, Aug 24; vs. canals, ed. 24-**88**; secondary, working of, Nov 1-**89**; R. locomotion, past and present, Tomlinson addr. May 9; Am. R. phrases, Aug 15-**90**; coast defence for, ed. May 15-**91**

E Mag state ownership, Croasdale, May, why they should not own the R's, Reece, Aug, Sep -**91**; benefit of R's and waterways, Apr; free travel on, Gribble, n June; and Wall st. finances, Greene, June; of future, O. Smith, Aug -**92**

E News foreign notes, ed. June 30-**88**; Pacific R. prob. in 1849, map, ed. * Feb 16, 16; the public and R's, Sep 14-**89**; cheap construct., Am. practice, ed. Mar 14; invention, effect upon means of intercommunication, Chanute, May 2; free vs. Gov't construct., Dorsey, 30; R's of world, growth 1885-89, June 13; foreclosures sales and receiverships for six months, July 11; boat around Dalles Rapids, Columbia river, proposed, inset * Sep 12-**91**; early pile R's, Oct 6; world's mileage, diags. (full) * Dec 15-**92**; humor, early English * Dec 27-**90**

E Rec U.S. R's and waterways, relations between, North report, Aug 27, Sep 3-**92**; R. eng. in prairies of Brit. No. Am., Money, abs. *Inst C E* v 94 -**88**; cost price on (French R's), Ricour, v 91, 93 -**88,** v 95 -**89** *An Ponts* * v 15 -**88**; R's of world, Kohl, abs. *Inst C E* v 108 -**92** *Civiling* -**91**; R. school

Railroads

in Europe, Ambrozovics *R & Eng* Oct -**88**; R's of world (mileage) Dec -**92**

R Gaz Pacific Commiss. report, Jan 6, Pac. and the Gov't., ed. 27, Feb 3, Eng'r's report to U. S. Com. May 11; Am. and English compared in op. expenses, Dorsey and ed. Dec 14; the R. year prog., ed. 28-**88**; ton mileage not always a criterion of econ., cor. Feb 22; West. R. Club pro. May 8; world's R's and ed. June 14, 14; Am. stats., hist., Hadley, Aug 2, 9-**89**

R Gaz Am. and foreign, Beahan, May 9 *J Assoc E Soc* Mar; R's of world *R Gaz* May 30, July 18; Am. and Europe, mileage, pop. and area, July 18; capital and profits, ed. Oct 17; cost of R. transport. vs. canal, 24; R. labor, tables, report, Dec 5-**90**; building, free vs. Gov't. control, Dorsey, abs. May 29; the R. prob., M'Nair, June 5, July 3; R's of world, table, stats. June 19; transport. cost, Haines, Oct 16; Am., German notes on, 23, Nov 6-**91**

R Gaz economies in maintenance of way, Reece, Mar 25; bks. on R's, review, Apr 15, 22, May 6; recent great pass. movements, Oct 21; maintenance of way question and ed. Nov 11, 11; mileage of world in 1890, table, Dec 2, Cen. bull. 16-**92**; feats of R. eng., Bogart *Scribner's* July; the R. in its business relations, Hadley, Oct -**88**; English Bd. of Trade requirements *The Eng* Oct 25-**89**. See also BRIDGES, railroad; CABLE R's; CARS; CROSS-ties; LOCOMOTIVES; PILES; RAILS; SHIP R's; STREET R's; TRAMWAYS, Guinness-Hunt; TRESTLES

ACCIDENTS, collisions, can they be prevented, cor. *El Rev* * Jan 23-**92**; a good bridge in distress, Stowell *E News* * July 7; small bridge failure, B. & O. * Nov 17-**88**; bridge failures of 1888, Stowell and ed. Mar 30-**89**; to persons, U. S. June 7-**91**, Feb 13, 20, Mar 5-**92**

R Gaz train, 16 years, table, Feb 15-**89**; train, in '89, Jan 31; stats. June 13; cost of, ed. Oct 24-**90**; train, in '90, table, Feb 13-**91**, in '91, Jan 29-**92**. See also files, 1888-92, each month, first or last number; British, English, see R. accidents, Great Britain

BRADFORD, Mass., R. Com's. report *R Gaz* May 11-**88**

CANADIAN R's, personal injuries *E News* June 23-**88**

CARLISLE, England, report and ed. *Eng* May 16, 16-**90**

DERAILMENTS on Com. So. div. Mich. Cen., for six years, table *E News* Aug 16-**90**

Railroads, ACCIDENTS, FLAT Creek trestle disaster, Knox., Cumb. Gap & Louis. *E News* * Aug 31 * Sep 7, ed. 14-**89**
GREAT Britain *El Rev Lond* July 6, Aug 10-**88**; Carlisle, report, ed. *Eng* May 16, 16-**90**; English, in '87 *E News* Aug 25-**88**, in '88, Sep 21-**89**; and U. S., stats. June 7-**90**; in '91, diag. * Sep 1-**92**; *R & Eng* July -**88**; *R Gaz* June 8, Oct 5, report, Dec 28-**88**, train, May 24, June 14, Aug 9, 16, in '88, report, Sep 13, Nov 15-**89**; and Am. Mar 28; report, Aug 8-**90**; train, Jan 16, Mar 20, in '90, May 15-29, June 19, Dec 18-**91**, May 20; and traffic, ed. *The Eng* Aug 26-**92**
GULF, Col. & S. Fe bridge washout, cor. *E News* * June 9-**88**
HAVERHILL, Mass., B. & M. *E News* * Jan 14-**88**
ILLINOIS river bridge *E News* * Feb 22-**90**
LA Salle, N. Y., bridge failure *E News* * Mar 23-**89**
MARSHALLTOWN, Iowa Cen. collision *E News* * Nov 8-**90**
MOENCHENSTEIN bridge, Basel, Switz. (full) *E News* * Aug 1, ed. 8-**91**
MUD river disaster, Lehigh Val., and ed. *R Gaz* Oct 19-**88**
NEW York Cen. & Hud. River *E News* Jan 2-**92**. See also R. accidents, Palatine br.
NEW York, L. Erie & W. bridge failure *E News* June 30-**88**
NEW York and Mass. *R & Eng* Mar -**88**
PALATINE bridge collision, N. Y. Cen. and ed. *R Gaz* Oct 4 -**89**
PEMBROKE, Ont., derailment near *E News* * Apr 5-**90**
QUINCY, Mass., Old Col., ed. *E News* Aug 30, R. Com. report and ed. *R Gaz* Nov 14, 21-**90**
RED river bridge derailment *E News* * Apr 28-**88**
ST. George, G. Trunk, disaster *E News* * Mar 9-**89**
SENECA river, C. Y. C. & H., a bridge which did not collapse *E News* * Nov 24-**88**
U. S., and Great Brit., stats. *E News* June 7; and English *R Gaz* Mar 28; *R & Eng* July -**90**
URBANA collision, cor. *E News* * Feb 11-**88**
WHITE river junction, B. & M., frt. train collision *E News* * July 5-**90**
WHITE Sulphur Springs *E News* * Jan 11-**90**
ACCOUNTS, class. and anal. of R. rates, Mordecai *Am C E* v 18-**88**; ed. *R Gaz* Mar 23; accounting, English methods, Sep 14 -**88**
ADVERTISING expenses, n *R Gaz* Sep 30-**92**

Railroads, AFRICAN Cen., proposed, Wiseman, ed. *R Gaz* * Aug 14, map (full) *Sc Am Sup* Aug 29, map *The Eng* * July 17-31 -**91**
ALGERIA *The Eng* Sep 27-**89**
AMBULANCE trains, Paris exhib. *Eng* * Mar 9-**90**
AMERICAN. See RAILROADS, U. S.
ARGENTINE Repub., Juarez *E News* Aug 4-**88**; Mueller *R Gaz* Feb 27-**91**
ASIA, map *E News* * Sep 29-**88**
ATCHISON, Top. & S. Fe, earnings, ed. *R Gaz* May 17-**89**; voting trust, ed. Jan 3; report, Dec 12-**90**
ATLANTA, in, Corthell report *R Gaz* Dec 30-**92**
ATMOSPHERIC, the *The Eng* Dec 23-**92**
AUSTRALASIA *E News* Mar 30-**89**
AUSTRALIA, table *E News* Jan 26; Greffrath *R Gaz* July 5-**89**; *The Eng* Dec 2-**92**. See also R's, New So. Wales
AUSTRIA *E News* Nov 14-**91**; zone tariff *R Gaz* July 25-**90**. See also R's, pass. rates, Austria
BAGGAGE checking in Germany *R Gaz* July 26-**89**
BALLAST scraper and leveler, Boutet's *R Gaz* * May 8-**91**
BALTIMORE Belt, map of Balt., Rea *E News* * June 28-**90**, York Road tunnel, inset * Jan 9-**92**
BALTIMORE & Eastern Shore, map, n *E News* * Sep 20-**90**
BALTIMORE & Ohio, hist. of construct., develop. and op., Cohen, Pres. addr., insets *Am C E* * v 26 -**92**; early hist. *E News* * July 14 *R & Eng* May, building, Cohen addr. (full) *R Gaz* July 1, 8-**92**; an. report, eds. Jan 20, Nov 30-**88**; Berlin yard * May 16-**90**
BARRE, Vt., profile *E News* * Aug 3-**89**
BAYONNE, Anglet & Biarritz *E News* * June 9, Carimanstrand *The Eng* May 25, 25-**88**
BELGIUM, notes *E News* * July 18-**91**
BENGAL Nagpur, conversion of meter gauge to Indian standard (5 ft. 6 in), Moyle *Inst C E* v 103 -**91**
BENGAL & No. W., locom. and rolling stock, Rhind, insets *Inst C E* * v 91 -**88**. See also RAILROADS, India
BICYCLE, Boynton's and ed. *E News* * Mar 2, 2-**89**; Gravesend Coney Is. n June 27-**91**
BOSNIA & Herzegovina State, Pfeuffer, abs. *Inst C E* v 109 -**92**
BOSTON, Mass., suburban pass. traffic, Rap. Tran. Com. report to Legislature, Apr *R Gaz* June 17-**92**

Railroads, BOSTON & Albany report *R Gaz* Sep 12-**90**, Sep 4-**91**
BOSTON & Maine frt. office, Worcester, Mass. *R Gaz* July 19-**89**
BOURNEMOUTH direct *The Eng* Mar 23-**88**
BRAKE beam forging machine, Bayley's *R Gaz* * Nov 21 * Dec 19-**90**
BRAKE beams, hanging from truck frames, L. & Nash., Leeds *E News* * Feb 21-**91**; tests *R Gaz* * Feb 8-**89**; strength, stiffness and resilience of iron trussed, J. B. Johnson * May 30 -**90**
BRAKE gear, rigging, Penn., foundation, n *R Gaz* * May 17; standard, M. C. B. com. report, June 28 * July 5-**89**; care and op., Parke, Dec 26-**90**; hopper coal cars, Ches. & O. * Feb 12-**92**
BRAKE shoes, M. C. B. tests *E News* * Jan 25, proposed, ed. May 17; and testing machine, C. B. & Q. * 31-**90**; metal, Sargent, discuss. *R Gaz* Oct 18-**89**; testing ap. do. * Jan 10, 24; metal, tests * May 30-**90**
BRAKE valve, Carpenter's (full) *R Gaz* * Sep 13-**89**
BRAKES, in New So. Wales, report *Eng* Nov 9-**88**; trials at Carlsruhe * Mar 29 * May 31; elec. * Dec 20-**89**; trials, India, Sep 12-**90**; and aut. couplers, prog. in use of on frt. cars, tables, ed. and colored inset map *E News* * Dec 21, 21-**89**; air, piston travel indics., Potts and Schroyer-Thompson, Swain report * Dec 20-**90**; air, Parke's slack adjuster * Sep 15: air and aut. couplers, Gov't. policy, Wall, 29-**92**; contin., class. of, Metcalfe, inset *Inst C E* * v 92 -**88**
R Gaz cause of shock, Hollerith, cor. * Apr 27; locom. and train, Howard * Nov 23-**88**; actual and possible braking power of a train, n * Aug 30-**89**; air, practice, Phelan, bk. review, June 6; 6-wheel truck, Wag. Pal. Car Co. * Aug 8; unconsidered elements in, Parke * Oct 24; trials in India, Westingh. and vac., table, Nov 7-**90**
R Gaz aut. air, Barnes * Jan 2, Feb 6; Australian trials (full) * July 31, Aug 28; frt. service, Rhodes, Oct 9; air, trials, New So. Wales (full) 16; air and steam hose specs. Nov. 6; practice, discuss. 20-**91**; air, standard tests, ed. Apr 1; power variations from different brake shoe metals, Synnestvedt, cor. Sep 16-**92**; German trials *Sc Am Sup* * May 11-**89**; aut. vac., thermodynamics of, Archbutt *The Eng* June 27, do. Deeley * July 11, and cor. Aug 8-**90**
BOYDEN power, tests *E News* Feb 2, B. & O. 9-**89**; driver gear *R Gaz* * Aug 14-**91**; air brake testing ap. * Sep 30-**92**

Railroads, BRAKES, EAMES vac., in 'Catechism of Locom.,' Forney, bk. *R & Eng* * July -**89**; *Sc Am Sup* * Apr 21 *The Eng* Mar 16-**88**

KANE'S *Sci Am* Feb 16-**89**

MANOMATIK momentum, the *R Gaz* * Mar 23-**88**

NEW York Air B. Co. *R Gaz* * Oct 10-**90**; Westinghouse and, Lehigh Val. tests, Burlington and ed. Feb 12, 12, emergency stops * 19 *E News* Feb 27, Mar 5; triple valve tests * Feb 13, 13-**92**

TURNER-Beard buffer frt. and ed. *R Gaz* * Feb 10-**88**

VAN Depoele's elec. *El Eng* * Dec 3-**90**

WESTINGHOUSE frt. train *Eng* * Mar 9-**88**; Belgian trials * Oct 17-**90**; German, Baden State R's., Kapteyn's ap. *E News* * Apr 20-**89**; frt. train test, effic. record of, July 12; rigging, Parke, Dec 20-**90**; R's equipped with, inset map * May 2; tests in So. Australia, Aug 1, frt. train, New So. Wales, 15-**91**; rack tests for, Apr 28, May 5; air pump and valve * Dec 29-**92**; 'Catechism of Locom.,' Forney, bk., inset *R & Eng* * Mar – May -**89**

R Gaz frt. train, H. H. West'gh. Jan 27; gear for 6-wheel truck * June 1, 8; quick acting, working instructions * 15-**88**; rules, N. P. Mar 15; gear for box stock and ore cars * Dec 20-**89**; recent imps., H. H. West'gh. Oct 10; and vac., trials in India, Nov 7-**90**; air, trials, Sep 16; imps. * Nov 25 -**92**; air, questions regarding use of *Sc Am Sup* Aug 1-**91**; goods train *The Eng* Mar 9-**88**; 50 carriage trains, expts. * Oct 31-**90**

BRAZIL *E News* Mar 30-**89**; map *R Gaz* * Dec 28-**88**

BRIDGES. See BRIDGES, names — railroad

BRIGHTON jubilee, England *The Eng* Sep 25-**91**

BROOKLYN bridge, N. Y., terminals, com. report and ed. *R Gaz* * Apr 27-**88**; traffic capac. (full) * Mar 28 * Apr 4-**90**; terminus report * Jan 16; passengers carried, diag. *St R J* * Sep -**91**. See also BRIDGES, Brooklyn

BUFFER, Westinghouse friction, tests *E News* * Mar 1-**90**; Webb's hydr. stop * Jan 24-**91**. See also R. bumper

BUILDINGS, Macon & Birm. standard, inset *E News* * May 26-**92**; structures, use of wood in, Jameson *R & Eng* fences * Feb, cattle guards * Mar, watchmen's houses * Apr, section h's * May * June, small stations * July * Aug – Dec -**89** * Feb – June * Aug – Oct * Dec -**90** * Jan * Feb -**91**

Railroads, BUILDINGS
R Gaz Berg, watchman's shanties * Aug 15, section tool h's * 29 * Sep 12, h's for employees * 26, reading and club rooms * Oct 3, 10, snow sheds * 17, signal towers * 24, ash-pits * Nov 7, sand h's * 28, oil storage * Dec 19-**90,** ice-houses * Jan 9, water stations * 23, car sheds * Feb 6, oil mixing * 27 * Mar 13 -**91**
BUMPER post, Jameson *R & Eng* * Mar -**89.** See also R. buffer
BURMAH - Siam - China proposed *The Eng* Apr 27, May 4-**88**
CABLE. See CABLE railroads
CALEDONIAN, English, notes *E News* * June 20-**91**
CALIFORNIA *R Gaz* July 22, Gray, cor. Aug 26-**92**
CAMDEN & Amboy, origin and early hist. *E News* Dec 12-**91**
CANADA, ed. *Eng* Oct 16-**91**; and U. S. '87 *E News* June 16-**88**; stats. July 27-**89**; and No. E., early, map * Aug 4; stats. n Sep 1-**92**; and canals *The Eng* Nov 9-**88**
CANADIAN Pac., Keefer, Pres. addr., inset map (full) *Am C E* * v 19 -**88**; T. K. Thomson *E Mag* * Dec -**91**; location through Rocky mts., profile diag., cor. *E News* * May 26; Sep 22, 29, Oct 13, 27, Nov 10-24, Dec 15-29-**88**; Province of Manitoba, Jan 5; arch culvert plans * Apr 6: report, May 25; minor structures timber works, inset * Dec 14-**89**; report and ed. *R Gaz* May 24-**89,** June 6-**90**; Keifer, abs. July 6-**88,** (full) *Sc Am Sup* * Feb 9-23-**89**
CARRARA-Marble District, Sheiber, inset *Inst C E* * v 103 -**91**
CARS and carriages. See CARS and carriages
CATTLE-guards, the Merrill *E News* * Apr 19-**90**; tests, Indianapolis, Dec 5-**91**; cor. * Jan 9; aut. surface * Nov 3-**92**; Jameson *R & Eng* * Mar -**89**; Iron surface, Nat. Surface G. Co. *R Gaz* * Feb 7-**90**
CAUCASUS & Cen. Asia, Abraghamson *R Gaz* Sep 30, abs. *Inst C E* v 109 -**92**
CENTRAL Am. interoceanic, map *Eng* * Aug 19, 26 * Sep 16-**92,** *R Gaz* Jan 30-**91.** See also RAILROADS, Pan-Am.
CENTRAL Pac. and Union Pac., driving last spike, Dillon *R Gaz* * July 29 *Scribner's* * Aug -**92**
CEYLON, n *E News* Feb 2-**89**
CHARGES in different countries, ed. *R Gaz* Mar 28-**90**
CHEAPEST in world, Pew *Am C E* * v 23-**90.** See R's, Dublin & Wrightsville, Ga

Railroads, CHEMISTRY applied to R's, C. B. Dudley *R & Eng* Dec -**89** - Feb, Apr - Dec -**91,** Jan, Feb, Apr - June, Sep * Dec -**92** *R Gaz* Jan 3-**90**

CHESAPEAKE & O. notes *R Gaz* Jan 8-**92**

CHICAGO R. terminal and harbor prob. *E News* June 9-**92**; do. Guthrie *R Gaz* Aug 8, Schmitt, Sep 26-**90**; exhib. imps. arrangements * May 27, 27; prob., ed. July 8; six old, ed. Oct 7, 14; exhib. communication map *The Eng* * July 22-**92**; Belt, proposed *R Gaz* * Sep 9; Union Transfer, map *E News* * Sep 8-**92**

CHICAGO, Bur. & Q. report. report abs. *R Gaz* Mar 22-**89,** Apr 4-**90,** ed. Apr 8-**92**

CHICAGO & No. West. report *R Gaz* Aug 2, ed. 9-**89**

CHICAGO, Rock Is. & Pac. finan. condition *E News* June 30-**88**; report *R Gaz* July 12-**89**

CHILI, projected *E News* Nov 10; No. & So. Am. Construct. Co., map * Dec 8-**88**; Mar 9-**89**; Jan 18-**90**; Lockett *R Gaz* * Nov 23-**88**; system, Conn (full) Oct 24-**90**

CHINA, first *E News* Dec 22-**88**; Sep 21, Nov 30-**89**; No, China and collieries, Kinder *Inst C E* * v 103 -**91**; Formosa Gov't. R., Matheson, abs. * v 109 -**92**; *R & Eng* Jan -**92**; *R Gaz* July 13-**88,** n * Feb 14-**90**; Kinder, Apr 10-**91**; (first) Tientsin & Kaiping *Sc Am Sup* Feb 9-**89**

CINDER loading plant, Cin. Wash. & Balt., Evans *E News* * Aug 30-**90**

COAL-chutes, Jameson *R & Eng* * Aug * Sep -**89**

COLOMBIA, in *The Eng* Nov 2-**88**

COMMISSIONS reports, Missouri, Me. *E News* Mar 31; Kansas, Apr 14-**88**; Me., Mass., R. I., N. Y. Aug 9-**90.** See also R's., Interstate Commiss.

CONGRESSES, internat. *R & Eng* Jan -**88,** Roll, Dec -**89,** Jan **89,** Jan -**90**; Milan, Cerbelaud, abs. *Inst C E* v 92 -**88** *Soc Ingen Civils* Nov -**87**

CONSTRUCTION, location with taper curves, Olmstead *E News* * July 21, 28; earthwork comput. formula, diag. * 28, ed Aug 18; from preliminary to track, Paret, Aug 11-25, Sep 1; a cross-section mnemonic, Echols, Sep 29-**88**; econ. of timber consumption for R's, Tratman, Nov 2; standard retaining wall, N.Y. Cen. * 30-**89**; location, Wellington * Jan 25, Feb 8; proper frog location, Avery * Mar 22-**90**; news and notes *E News* files. See also R's, curves — location — U. S.; TRACK, etc.

Railroads, CONTINUOUS, Silsbee's multiple dispatch, Schmidt *Eng* * Jan 9-**91.** See also R's, sidewalk
CORPUS Christi & So. Am. *E & Min* Sep 20-**90**
COSTA Rica, n *E News* * Feb 16-**89**
COUPLERS, U. S. R's equipped with M. C. B. aut., inset map *E News* * Apr 25, 25-**91.** See also CARS, couplers
CROSSINGS, of great rivers, location, Zdziarski *R & Eng* * Aug – Nov -**92**; grade, abolition in Mass., ed. June 27, Mass. law, July 25-**90**
BUFFALO grade, prob., Guthrie *R Gaz* * May 6-**92**
CHICAGO grade *E News* * Sep 22-**92**; Stewart ave. (complicated) *R Gaz* * Apr 24-**91** * Jan 29-**92**
COMPLICATED, Minn. & St. Louis *E News* * Dec 28-**89**; N. Y., Prov. & B. * Apr 26; Penn. R. * Mar 15-**90**; Chic., Stewart ave. *R Gaz* * Apr 24-**91** * Jan 29-**92**
FONTAINE continuous *R Gaz* * June 19, (details) * Dec 18 -**91**
GRADE, who should pay for the abolition of, Mass. R. Commiss. reports, ed. *E News* Aug 4-**88**; abolition in Mass., ed. *R Gaz* June 27, Mass. law, July 25-**90**. See also R's crossings, Buf. – Chic. – Worcester, etc.
MASS. R. Commiss. report, ed. *E News* Feb 23-**89**
MOVABLE point, Wharton R. Switch Co. *E News* * Dec 14 -**89**
WOODLAWN, N. Y., N. Haven & H. *E News* * Jan 24-**91**
WORCESTER, Mass. grade, prob. at *E Rec* Apr 30-**92**
CUBAN, operating expenses *E News* June 23-**88**
CULVERTS, standard box and road beds, Kan. C. & Om. *E News* * Mar 3; pipe, 31-**88**; wooden box and cattle-guards, Or. Pac. standard * Jan 12, pile and box drains * 19; plans, Can. Pac. * Apr 6; arch, I. D. & S. * June 8; and cattle-guards, Can. Pac. * Aug 24, B. & M. * 31-**89**; R. maintenance requirements, Swift * May 30 * June 6, 13, 27-**91**; Jameson *R & Eng* * Apr -**89**; Ind., Decatur & Springfield, Hill *R Gaz* * May 25-**88**; pipe, 'Plant' system, Howe * Apr 24-**91**
CURVES, transition, Cain *Am C E* * v 26, method of running in, Ward, v 27 -**92**; resistance expts., ed. *Eng* Sep 23-**92**; safety and anti-friction device, Pendleton *E & Min* * Apr 12-**90**
E News easement, rules for, Young, cor. Aug 18; field notes, best form, Burgess, Sep 22-**88**; Echols, cor. * May 4-**89**; a 24° curve on trestle, Paddock * May 10; sharpest in use, Hill,

Railroads, CURVES
July 12-**90**; transition, locating, Hughes, cor. * Dec 29-**92**; easement, Frescoln *Lehigh Eng J* Feb, location of, F. P. Spalding, Oct -**88**
R & Eng transition or easement, Jameson * May - July -**89**, Philbrick, Riffle, cor. * June -**90**, Echols * Oct -**92**, Gieseler, *R Gaz* Jan 4, Feb 8, Mar 22, Beahan, cor. * May 31-**89**, Talbot, July 31-**91**, C. Allen, May 27; resistance, Banderali, Oct 7-**92** *Eng;* curve ranger, Trotter *Sc Am Sup* * Jan 11-**90**. See also CURVES; INSTRUMENTS
CUTTING cross-section area, method of cal., Breakell *Inst C E* v 104 -**91**
DECAUVILLE portable system, Paris exhib. *Eng* * May 3 * June 7, 14, *E News* * June 1, and rolling stock *The Eng* * May 24-**89**, working results, Jan 24-**90**
DEMURRAGE, St. Paul-Minn. Assoc. and ed. *R Gaz* Jan 29, 29 -**92**
DENVER, Col. Canon & Pac. project, Stanton *E News* Aug 17, inset * Sep 21, and ed. (full) * Oct 18, 18-**90**
DUBLIN & Wrightsville, Ga., cheapest in world, Pew, discuss., insets *Am C E* * v 23 -**90** *E News* Aug 9-**90**
EARLY, horse power and sails on *E News* May 11-**89**
EARNINGS and dividends, ed. *R Gaz* Sep 28-**88**
EARTHWORK. See EARTHWORK
EAST Tenn., Vir. & Ga. report *R Gaz* Nov 13-**91**
EGYPT, Kupka, *Eng* * June 5-**91**
ELECTRIC, elec. working of, limitations of steam and electric. in transport., Hall *Am M E* v 11 -**90** *E News* July 12, 12 *R Gaz* May 23, 23-**90**; as applied to steam roads, Dashiell *Am M E* * v 13 -**92** *Cassier's* * May -**91**; coming development, Sprague, Nov *El Wld* June 18 *E News* July 7, 14-**92**
El Eng munic. rap. tran. by, Sprague (very full) Aug, discuss. (very full) *El Rev* * July 21, do. *El Eng* Nov; st. R's in Am. (list) Dec -**88**, Jan, Mar-Dec; Mansfield, Sep, table *El Rev Lond*, Aug 30 *El Rev* 17 *R & Eng* Oct -**89**
El Eng st., interference with telephone service, legal decis. Mar; st., Sprague, Mar *El Rev* Mar 8, (full) *El Wld* Feb 22 *St R J* Mar; social side, Martin *El Eng* Apr 2 *El Wld* Mar 22, (full) *Sc Am Sup* May 3 *St R J* Apr; tramway data, Hutchinson *El Eng* Apr 16; evolution of, Wetzler, 23 *El Rev* 26; single and double trolley systems, Mansfield, May 17.

Railroads, ELECTRIC

table *El Rev Lond* Aug 30 *El Wld* 17, addr. *E News* July 13, *The Eng* Sept 6 *El Eng* May 7; limitation of steam and electric in transport., Crosby (full) 28, (full) *El Wld* 31; traction data, Reckenzaun *El Eng* * June 18 *El Wld* * 7; underground system, Wheeler *El Eng* * Sep 24; mo. power, technically considered, W. Allen, com. report, Oct 22 *El Rev* 25; overhead line construct. *El Eng* * 29; Harding conduit system * Dec 3-**90**

El Eng hist., stats., Pope, Jan 28, (full) *El Rev* 31, notes *El Wld* 31 *St R J* Feb; overhead construct. *El Eng* Jan 28; high speed work, Crosby report (full) * Mar 11, discuss. * 18, (full) *El Rev* * 14, (full) * 14, discuss. * 21, (full) *St R J* * Apr; construct. and op., Field *El Eng* * Sep 16, (full) *St R J* Oct; three years' development, Griffin *El Rev* 19 *El Wld* 19 *St R J* Oct *El Eng* Sep 16; standards, Crosby, Oct 28; the dependent overhead or underground system, Mansfield, 28 *St R J* Nov; most econom. power, tables, Badger report *El Rev* 31, (full) *El Wld* 31 *E News* 24 *El Eng* Oct 28-**91**

El Eng construct., McCay * Jan 6, Feb 24; overhead wire, Peck * Mar 2 *El Wld* * 5; engines, high and low speed, comparative tests, Wason *El Eng* 9, Serrell, 23, Wason, Apr 27; future development, Sprague, June 15-29, July 6, (full) *El Rev* Aug 13 *El Wld* June 18 *R & Eng* Sep *St R J* July, Aug; series elec. traction propul. system, Perry, Leonard *El Rev* * 18 * July 2 *El Wld* * 18, 18, Dec 3, 10, 24 *St R J* * July *El Eng* * June 15; a model roadbed and underground wiring, Baumhoff report, Oct 26, (full) *El Wld* 29 *E News* 27; machine shops econ., Bickford, com. report *R Gas* 28 *St R J* Nov *El Eng* Oct 26; elec., horse and cable, relative cost of op., Ramsay, com. report, 26, tables *El Rev* 29 *El Wld* 29 *R Gas* 28 *St R J* Nov; resistance of return circuits, Warner, *St R J* * Dec *El Eng* Nov 7; and elec. light plants op. from same station, McCay, Dec 28-**92**

El Rev Lond overhead wire strains, tables for cal. Mar 30; Sprague, ed. Aug 3, discuss. (full) Nov 9; undergr. vs. overhead wires, N. Y., Wheeler, Nov 2 *El Rev* * Sep 15, (full) *El Wld* 8 -**88**; traction probs., Bell (full) *El Rev Lond* July 12; applic. of electricity to, Sartiaux report, Nov 29-**89**

El Rev Lond st., Sprague, Mar 21, 28; traction data, Reckenzaun, May 9, 16; single and double trolley wire systems for.

Railroads, ELECTRIC

Mansfield, June 20; traction prog., Bell, July 11; overhead wires (mechan. strains), S. Russell, Oct 24, construct. * Nov 21; st., Bailey, Dec 26 *El Wld* Nov 22-**90**; traction, Reckenzaun, May 29, June 12, July 17; for rapid interurban commun., Zipernowsky, Sep 18, 25, Oct 2-**91**; traction, cost, Reckenzaun (full) * Mar 25; traction for tram cars, Epstein * July 15-**92**

El Rev elec. vs. horses, Oct 27-**88**; st., Griffin, May 11 *Sc Am Sup* June 15; series traction (undergr. conductor), Manville *El Rev* Oct 12; electric. for st. cars, Am. St. R. Assoc. com. report, 26-**89**; Waller-Manville traction system * June 14; Bailey, Nov 22-**90**; construct., Field (full) * Sep 19 sup; the dependent overhead, Mansfield and independent storage systems, Neftel, com. reports, Oct 31, 31, (full) *El Wld* 31, 31 *E News* 31-**91**

El Rev traction, compar. of mod. methods, May 28 *The Eng* Mar 25; relation of electric. to transport. June 25; discuss. (full) Nov 19, 26, traction, Dec 17, McTighe, 3-17; Pruynway elec. elevated * 24-**92**

El Wld Sprague, discuss. Oct 20-**88**; traction probs., Bell (full) * June 22; st., Am., table of, Oct 19; electric. as mo. power, com. report, 26; car service points, Crosby, Dec 21-**89**

El Wld single trolleys, City & Suburb. Telegr. Assoc., Taft decis. (full) Mar 1; Knoxville decis., Gibson's May 3; single and double trolley systems, Mansfield, 10; storage bats. and horses, compar. cost, Gadot, 10, 24, 31, June 7-21; the cur. as a traction increaser, Ries, June 7; traction prog., Bell, 28; lighting in R. service, Leonard (full) July 12; double trolley system imps. * 12; Harding's closed conduit * Oct 11; op. of, 18; earliest (hist.) * 18; mo. power, com. report, 25-**90**

El Wld construct., bonding the track, Colgate * Mar 14, line * 21, feed and trolley wires * 28; st. stats., Cen. bull. May 9; traction cost, West End, Boston, Sep 5; construct. and op. and cen. station interests, Field (full) 19; mo. power for st., com. report (full) 26; for rap. tran. between cities, Zipernowsky, Oct 10; Edison's view of future, 31, cors. Nov 7; cars speed in city sts., Hewitt * Dec 19-**91**

El Wld undergr. system, Bolling * Mar 19; track bonding and overhead construct., Wiley * Apr 2; transport. relations, Selden, June 25; legal decis. (full) July 19, litigation, Stone, Sep 3, 10; st. standards for, Crosby, Oct 29-**92**

Railroads, ELECTRIC

E Mag Sprague, May; undergr. vs. overhead wires, Webb, Aug; st., advantages, Prindle, Aug -**91**; st., as investments, Serrell, May -**92**; and cable, return of power in, Bryson *E & Min* * Dec 7-**89**

E News growth, Sep 7, Oct 6; cost and prog., T-H system * Nov 10; max. gradients on, Dec 1-**88**; Boston, Aug 10-**89**; cable, elec. and animal power, rel. econ., Cen. bull. report, May 23; st., mo. power for, Beckley, Sep 26-**91**

E News cost of traction, Sellon, Apr 16, imps., McIntire, Sept 29; conduit, Barkley * Oct 20; Intramural elevated elec., World's Col. exhib., inset * 20; and cable, compar. cost of op., report, 27 *E Rec* 29-**92**; st., table, Preece, Feb 11-**88**; development, Sprague, May 9; st., finances, Beckley, Sep 26-**91**

F Inst Griffin, Apr -**90**; applic. of electric. to, Sprague, abs. *Inst C E* v 100 -**90** *El Wld* v 15 -**90**; st., data, Sprague system, Hutchinson, abs. *Inst C E* v 101 -**90** *El Eng* -**90**; and cable, Kebby, abs. *Inst C E* v 105 -**91** *J Assoc E Socs* Feb -**91**; elec. locomotion, Geipel *Inst M E* Feb -**88**; in cities (extent) *R & Eng* Nov -**90** *El Eng;* elec. light in R. service, Markland *R Gas* Feb 27-**91**; future, Sprague, abs. July 8 -**92**

Sc Am Sup traction and accums. * Apr 13-**89**; Nov 15-**90**; conduit, Field * Mar 14; notes, Pope, Apr 4; high speed work, Crosby (full) * 18; development, Griffin, Oct 10-**91**; trolley system discuss. June 4; overhead system * Dec 24-**92** *St R J*

St R J storage and direct systems, Blackwell cor. Apr; traction, Sprague cor. June, munic. rap. tran. prob. do. Aug; list Nov -**88**; Bentley-Knight * Feb; Mansfield, Sep; mo. power finan. conditions of success, Barr report, Nov -**89**; trams cable, horse and other, Fairchild (very full) * Mar - July * Sep * Oct * Dec -**90** * Jan - Apr * June -**91**; mo. power, com. report, M'Carty, Nov, Nov -**90**

St R J Thos. Davenport's model invention, Pope * Apr; and cable construct. and op., Kebby (full) May; Condict. July; overhead wire, instructions to linemen, Baker * Aug; mo. power for st., com. report, sup. Sep 15, Oct; from sociological point of view, Crosby, Nov; nomenclature of terms used, Nov; practical side of, Bickford * Nov, Dec -**91**

St R J overhead construct., Bickford, Feb * Mar, C. Smith report, Nov; and cable, rel. advantages, Feb, cor. Mar, July,

Railroads, ELECTRIC

Aug; standards, Crosby report, Nov -**92**; Griffin (full) *Soc Arts Mass* -**89**

The Eng in U. S., list, Feb 15; Northfleet series, inset * Mar 15-**89**; troubles in Am., Sprague, Mar 13-**91**; traction and finan. aspect, Sellon, Mar 25, cost and load diags., Reckenzaun, Apr 1, Jarman system * June 10-**92**. See also STREET R's

ALBANY *St R J* * June -**90**

ALLEGHENY City, Pa., Bentley-Knight *El Wld* * Feb 18-**88**

ASBURY Park, N. J., Daft, power test, Idell *El Wld* June 8-**89**

BENTLEY-Knight imps. *El Rev* * May 4-**89**; (conduit) *St R J* * Mar -**88**; * Feb -**89**

BESSBROOK & Newry, Hopkinson, discuss., inset (very full) *Inst C E* * v 91 -**88**

BIRMINGHAM, England *St R J* Dec -**91**

BOSTON, Mass., West End st. n *El Rev* * Aug 27-**92**; power station *Pwr* * Apr, n *El Wld* * Jan 18-**90**; traction cost, Sep 5-**91**; report, Aug 20, Nov 19-**92**; *E News* Aug 10-**89**; rail section * Oct 25-**90**; Whitney, abs. *Inst C E* v 99 -**90** *El Eng;* power plant *St R J* Dec -**89** * Jan -**90**; * May; report, Dec -**91**; Sprague system * Jan -**89**. See also ST. R's, Boston

BRAIN system of traction *El Rev Lond* * Sep 9 *Eng* * Sep 9, closed undergr. conduit, n *E & Min* * Sep 24 *St R J* * Dec-**92**

BRAKES, Widdifield & Bowman *El Wld* * May 18-**89**; Genett's elec. air *St R J* * Aug -**92**

BROOKLYN trolley system dangers, Moses *El Rev* * Sep 10-**92**

BUDAPEST, Hering *El Wld* * Oct 24-**91**; undergr. conduit, May 14; Bartol, n *F Inst* * Feb -**92**; Uppenborn *Sc Am Sup* * July 4; Gribble *St R J* * July -**91**

BUFFALO (plant) Field *St R J* * Feb -**91**

BURGENSTOCK, first mt., Lucerne, Switz. n *The Eng* Sep 7-**88**

CARS, elec. cur. as a traction increaser, Ries *El Eng* June 4; Edison's gear * Sep 17; Westinghouse * Oct 15; Baldwin's reversing gear * Oct 22; Belding's gear * Nov 26-**90**; T-H single reduction, * Feb 4-**91**; hist. review *El Rev* sup. * Oct 18-**90**; Bentley-Knight truck, standard motor *El Wld* * Jan 12 * May 4-**89**; running gear * Oct 18-**90**; Pullman st. double deck *E News* * Oct 31-**91**; Wenstrom hydr. gear *The Eng* * Dec 5-**90** *El Eng.* See also R's, elec., brakes — fenders — heaters

Railroads, ELECTRIC, CHICAGO - St. Louis high speed, proposed *El Wld* * Feb 20, Adams * June 11-**92**
CINCINNATI, Sprague system *Eng* * Aug 8-**90**
CONDUITS, Harding's closed *El Wld* * Oct 11-**90**; Barkley *E News* * Oct 20-**92**; Field *Sc Am Sup* * Mar 14-**91** *El Eng.* See also R's elec., Bentley — Brain's — Budapest — Love — Siemens, etc.
DAFT, work on elevated roads and rap. tran. *El Eng* Aug *El Rev Lond* * Aug 2, 9; test, Idell *Sc Am Sup* June 22-**89** *Steven's Indic*
DUBUQUE, Ia. Edco storage bat. motor, De Land *El Wld* * July 25-**91**
EDCO storage bat. st. car, Bates *El Eng* Oct 22 *El Rev* 25 *El Wld* 25 *St R J* Nov -**90.** See also R's elec., Dubuque
EDISON'S st. *El Eng* Nov 18-**91**
EICKEMEYER-Field motor *El Eng* * Dec 9-**91**
FENDERS, West End, Boston, report *E News* Feb 21-**91** * Oct 27-**92**
FLORENCE & Fiesole, Sherbner (full) *El Rev Lond* * Sep 25, inset *Inst C E* * v 106 -**91**
FRANKFURT-Offenbach tramway, Krause *El Eng* * June -**88**
GEARING, epicylic, for cars and elevators, Aldrich *El Eng* * June 22-**92**; wooden-toothed *El Wld* * Aug 2-**90.** See also R's., elec., cars — motors
GREAT Britain, tramways position in England *El Rev* Aug 8 *E News* July 18-**91**; United Kingdom, table *El Wld* Jan 25-**90**; and cable, McCallum *St R J* Oct -**92**
HEATERS, the Carpenter-Nevins *El Eng* * Dec 3; elec., Hanna *El Rev* * Dec 6-**90**
HAMBURG, Huber, inset *Inst C E* * v 92 -**88**
IRISH'S system *The Eng* Apr 6-**88**
LINEFF tramway system *El Eng* * Oct 29, Kapp report *El Rev Lond* * July 4, 25, Sep 19 *El Wld* * Oct 4; undergr. system *St R J* * Nov; magnetic *The Eng* * Aug 15-**90**
LIVERPOOL elevated *Eng, The Eng* * Aug 15-**90**
LONDON, City & So. Lond. subway *El Rev Lond* * Nov 7-**90,** Grindle, July 29, Aug 12, Sep 16-**92** *El Wld* * Nov 29-**90** *R & Eng* * Jan -**91**
LOVE conduit system *R Gas* * Sep 9-**92**
LOWELL, Mass. plant *Pwr* * Dec -**91**

Railroads, ELECTRIC, LYNN, Mass., profile *El Rev* * Dec 8 -**88**

MOTORS, st., Manhattan elevated and st. locom., compar. tests, Moss, discuss., insets *Am C E* * v 23 -**90**; total effic. and power required to drive car, Bonnett, v 27 -**92**; Eickemeyer-Field *El Eng* * Dec 9; formulas, Reid, 23-**91**; elec. control of, methods, Parshall * Apr 27 *El Rev* * 30, discuss. (full) May 14 *El Wld* * Apr 30 * May 14 *St R J* May; tests at Minneap., Shepardson (full) * July 9 *El Rev* * 16, (full) *El Eng* 13; st. car, testing, Hutchinson * Aug 31; Rae, equip. * Nov 30; Sprague, test *El Rev Lond* 11-**92**

El Rev Sprague, magnetic data, Parshall * May 31 *El Wld* * 31; the Wenstrom * Sep 27-**90**; the Palmer * Nov 28-**91**; Bentley-Knight standard *El Wld* * Jan 12 * May 4; Sprague st. Dec 14-**89**; in R. work, Bell *R Gaz* Mar 21-**90**, eds. Apr 17, 24-**91**, (full) *El Wld* Mar 22; wooden-toothed gearing * Aug 2-**90**; Short's gearless, Higgins (full) *St R J* * June -**91** * May *El Wld* op. (full) * Apr 16; bucking of st. motors, Shepardson * Sep 10-**92**; new departure in construct., Leonard *E News* Nov 28-**91**; Sears, ed. comments *R Gaz* Nov 18-**92**

St R J prob., Mailloux * Feb -**90**; Patton, n * Oct -**91**; single, for cars, Sperry * Apr; and dynamos manuf., T. H. Elec. Co., Lynn * Aug * Sep -**92**

NEVERSINK mt., test, Hering, Aldrich (very full) *El Wld* * May 28 - July 30-**92**

NEW York, Fulton st., Bentley-Knight (undergr. wire) *E Rec* * Apr 6, n *The Eng* * Feb 1-**89**

PARIS, Julien-Tournier-Broca *E News* * Aug 11-**88**

PITTSBURG *E News* June 30-**88**

POLE, the Milliken *E News* * May 3; Phœnix iron col. *R Gaz* * May 2-**90**

POWER stations, Mailloux's system of power equalizing *El Eng* * Dec 3-**90**; Church, n * Apr 27, points * June 29; Mailloux, Aug 31-**92**; tests, Hale *El Rev Lond* * May 30 *El Wld* * 17-**90**; high and low speed engines, compar. test, Wason, Mar 19, Apr 30; importance, Roberts, Oct 22; ideal, Field, Dec 31, etc. -**92**; Mackie *El Rev* July 23, 30, Aug -**92**; (steam) plant, Field *Pwr* * Oct -**91**; Church * June -**92**; *St R J* * July -**91**; Field, Cook * Feb, Bickford * Mar * June * Sep * Oct -**92**

Railroads, ELECTRIC, BIDDEFORD and Saco, Shaw *El Eng* * Nov 23-**92**
BOSTON, West End, Shaw (full) *El Eng* * Oct 21-**91**, n *El Wld* * Jan 18 *E Rec* * Apr -**90** *St R J* * Dec -**89** * Jan -**90** * Sep -**92**
BROOKLYN City *St R J* * Oct -**92**; Buffalo, Field *El Eng* * Jan 28-**91**; Chic. City *St R J* * Dec; Columbus, O. * June -**92**; Indianap. *El Rev* * July 5-**90**
KNOXVILLE, Tenn. *El Eng* * Aug 6 *El Rev* * 9 *Pwr* * Aug -**90**; Lake Roland eleva. R., Balt., Abbott *El Eng* * Dec 7-**92**; Little Rock, Ark. (full) *El Rev* * Aug 20 *St R J* * Sep -**92**
LOWELL, Mass., Shaw *El Eng* * Jan 14-**91**; Lowell & Suburban, do. * Oct 12-**92**; plant *Pwr* * Dec -**91**; Newark, N. J. * Jan -**92**; Pitts., Duquesne traction Co. *St R J* May -**91**; Topeka, Kan. rap. tran. *El Rev* * May 25 *El Wld* * 25-**89**; Utica, N. Y., test, Heilman, June 6-**91**
RAE system *El Eng* * Oct 15-**90**
RICHMOND Union, inset (full) *St R J* * June -**88**
RIVER & Rail storage car system *El Eng* * Aug 6 *El Wld* * July 26-**90**
ST. Paul, Minneapolis, *St R J* * Sep -**91**
SERIES Elec. Traction *El Rev Lond* * Mar 15-**89**
SHORT series system *St R J* * May -**88**, sup. * Oct -**92**
SIEMENS & Halske's conduit *St R J* * Dec -**92**
SISSACH-Gelterkinden, the (full) *El Wld* * Nov 7-**91**
SNOW sweeper, Thomson-Houston *El Rev* * Jan 9-**92**
SPRAGUE system *El Eng* * Sep -**89**; vs. T. H. system, Hutchinson *El Wld* Nov 1-**90**; Boston *St R J* * Jan -**89**
SOUTH Staffordshire tramways *El Rev Lond* * Nov 18 *The Eng* * 18-**92**
STORAGE bats., Direct Elec. Co's system *El Eng* * May 13; in traction work, Pumpelly, July 9-**90**; Phil., Lehigh ave. * Mar 25-**91**; in R. work, Macrae, June 29-**92**; traction, Bracken *El Rev* Aug 24 *St R J* Sep *El Wld* 17; Bell, Oct 5-**89**
El Wld (accums.) vs. direct cur. for traction, Hunter, May 12; Julien reg. switch * July 21-**88**; and horses, compar. cost, Gadot, May 10, 24, 31, July 7-21; Chamberlain's rack * Aug 9 -**90**; (accum.) traction, Paris, n Apr 9-**92**
E News or accum. traction in England, June 14-**90**; present status, Salom, Sep 1 *F Inst* Aug -**92**; Dubuque bat., De Land,

Railroads, ELECTRIC, STORAGE batteries
abs. *Inst C E* v 106 -**91** *El Wld* v 18 -**91**; applic., Hewins * *Soc Arts Mass* -**90**
St R J Sprague system, Boston * Jan -**89**; Fairchild * May; Main's system * July -**90**; mo. power, storage or primary, independent system, Neftel, Nov -**91**; cals. for, Huber, n *The Eng* May 4-**88** *El Eng.* See also R's, elec., Edco — River & Rail, etc.; STORAGE bats.
SYRACUSE, N. Y., 3d ward, effic. test, Hulett *El Wld* * Aug 16 *St R J* * Sep -**90**
THOMSON-Houston system (full) *El Eng* * May -**89**, cost and prog. *E News* * Nov 10, 24 *St R J* * Dec -**88**; dynamos manuf., Lynn * Aug * Sep -**92**
TROLLEY guide, Galloupe's *El Rev* * Jan 9-**92**
WALLER-Manville system *El Rev Lond* * May 9 *Eng* * 9 -**90**
WEEMS' parcel elec. car, high speed work, Crosby (full) *El Rev* * Mar 14-**91**; *E News* * Sep 14-**89**
WENSTROM system *El Wld* * Oct 25-**90**
WYNNE'S urban system, report *El Wld* * Mar 29 *E News* Apr 5-**90**
ZIPERNOWSKI vertical rail tramway *El Rev Lond* * Nov 15 *El Wld* * Dec 7-**89**
ELEVATED, elec. work on and rap. tran., Daft *El Eng* Aug *El Rev Lond* * Aug 2, 9-**89**; Pruynway elec. *El Rev* * Dec 24-**92**; Riley elec. system *El Wld* * Mar 16-**89**; Day system *E News* * Dec 12; elec. mo. power on, W. N. Smith (full) *Sc Am Sup* * Feb 21, 28 * Mar 14; and incline plane, Fairchild *St R J* * Feb * Mar -**91**; Rap. Tran. Commiss. report to Mass. Legislature, Apr 5-**92**. See also CABLE R., Los Angeles single-post viaduct; R's, incline — mt.
BERLIN Met. viaduct *E Rec* * Feb 4, 11, 25 * Mar 3-**88**
BOSTON (schemes) *E News* Apr 6-**89**; June 14-**90**
CHICAGO rap. tran. *Eng* * Nov 20-**91**, high level *E News* * May 11-**89**; Chic. & South Side Rap. Tran., inset * Jan 16, terminal station * May 5-**92**, stations *R Gas* * Apr 4, 11; Lake st. * Mar 7-**90**; the 'Alley' and So. Side, inset * Oct 28 *Sc Am Sup* Nov 26-**92**
LAKE Roland, Balt., Md., Abbott *El Eng* * Dec 7-**92**
LIVERPOOL *Eng* * Dec 18, inset * 25 *E News* Sep 5-**91**; Overhead *R Gas* Oct 7-**92**; elec. *The Eng* * Aug 15-**90**

Railroads, ELEVATED, KANSAS City, Inter-state Rap. Tran., foundations for cols. *E News* * Apr 21, May 12, 19-**88**
NEW York city, elec. work on and rap. tran., Daft (full) *El Rev* * July 6 *El Wld* * 6-**89**; business '92, report, n *Eng* Dec 23; coal consumption on, n *E News* Oct 5-**89**; capac. of increasing traffic of, ed. Jan 11-**90**; rap. tran., inset * Dec 1-**92**; trains tonnage, Manhat. R. Co. *R Gaz* Jan 3-**90**; Suburban rap. tran. * July 24-**91**; legal cases, Wood, Jan 15, 22, Feb 5; Manhat. pass. traffic diag., Croes *Dec 16, etc. -**92**
PENN. R., 4-track viaduct *E Rec* * May 24-**90**; cost and saving, ed. *E News* Nov 24-**88**; Jersey City terminals viaduct *R Gaz* * Dec 12-**90**
QUAKER City, Phila. *R Gaz* * Dec 16-**92**
EMBANKMENTS, German, drainage of a *E News* * May 10-**90**. See also EARTHWORK; R. construction — location
EMPLOYEES, wages in Indiana *E News* Feb 23-**89**; accidents to, in Great Brit., table, ed. Dec 20-**90**; employee's premiums, Ambrosovics *R & Eng* Nov -**90**
ENDLESS, Fender's (wheel ap.) *Sc Am Sup* * Feb 11-**88** *Industries*. See also R's, sidewalk
ENGINEERS, division and resident, ed. *E News* Jan 21-**88**
ENGLISH and Am. See R's, Great Brit. — U. S.
ENGINE houses, Berg *R Gaz* Mar 11 * 18-**92**
EQUIPMENT register and case, Harrington's *R & Eng* * Dec -**88**
ERIE. See R's, N. Y., Lake Erie
EUROPE, notes from abroad, ed. cor. *E News* Aug 9; (length), table *R & Eng* Aug -**90**
FARES, zone system and Mass. *E News* * Mar 12, do. (tariffs) Hungary, Acworth *Rev Gen Chem Fer* Apr, do. Austria, Aug 19*th Cent* Dec -**92**, and England, do. Sep -**91**, pass. tariffs, remarkable expt. *R Gaz* Oct 25-**89**, Oct 2-**91**; pass., Austria, ed. May 23-**90**. See also RAILROADS, pass.
FENCES, Jameson *R & Eng* * Feb -**89**
FLANGE scraper, the Nevins *E News* * Sep 19-**91**
FOG signal, Drummond's *R Gaz* * Dec 6-**89**
FOREST supplies relation to, Kern *E News* Sep 15-**88**
FORMOSA, Is. Gov't. *Eng* * Mar 25, May 6, 13 * June 3 * July 1; Matheson, abs. *Inst C E* * v 109 -**92**
FORTH bridge, Scot., report *Eng* Jan 20, Apr 13-**88**; Oct 25-**89**; report, Mar 14-**90**; Hutchinson report *The Eng* Apr 13-**88**

Railroads, FRANCE, state ownership of, n *E News* Dec 20-**90**; notes * July 11-**91**; consumption of ties on, Feb 20-**92**; traffic distrib. and cost price of transport., Recour, abs. *Inst C E* v 91, 93-**88**, 95-**89** *An Ponts* * v 14 -**87**, 15-**88**; in '88 *R Gaz* Apr 11-**90**; prog., Foy *The Eng* Dec 11-**91**, Jan 8; Northern France, profile between Paris and Amiens * Dec 23-**92**

FREIGHT, effect of haul on cost of handling, Petri *E News* * Mar 26-**92**; Hodge's universal frt. tariff *R Gaz* Sep 21-**88**; car service, equity of per diem and mileage plan, Yardley, cor. Mar 15, Wattson, cor. Apr 5; B. & M. frt. office, Worcester, July 19 -**89**; car mileage decrease on home roads, Wattson, July 11; handling and distrib. on West Shore, do. Oct 10; class., English, 31-**90**

FREIGHT shed, iron, N. Y. Cen. *E Rec* * Feb 22-**90** *R Gaz* * Mar 1-**89**

FREIGHT yards, Morrison *R Gaz* Mar 25 * May 20, Appleton, June 10, Dearborn station, Chic. * 24; Altoona, Penn. R. * July 29-**92**

FROGS, the Parsons, Brooklyn br. n *R Gaz* * Feb 21; spring rail, Mich. Cen. * May 16; Campbell solid steel * Aug 1-**90**; and switches, Ellis, May 29; frog angles det. by differential calculus, Haskell * June 5-**91**; Vaughan spring rail * Oct 7 *E News* * 13-**92**

GAUGES, changing, abolition of broad on Great West., insets *Eng* * June 3, 10, and in U. S. *E News* Aug 25; *R Gaz* * June 10, and equip. for * Nov 4, map *The Eng* * May 13-27-**92**; of the world *E News* Dec 8 *R Gaz* Sep 14-**88**. See also R's, narrow gauge

GAUTEMALA Cen., narrow gauge *R Gaz* Aug 16-**89**

GERMAN *E News* June 2; n Oct 13; stats. '86-7 *R Gaz* May 25 -**88**, '87-8, Oct 4; origin, methods, rates and class. Dec 27-**89**; stats. July 4-**90**; *The Eng* Jan 15-**92**

GIEN to Auxerre, consolidation of earthworks, Lethier, abs. *Inst C E* v 95 -**89** *An Ponts* * v 16 -**88**

GLISSANT (sliding), Paris and ed. *E News* * Aug 31, Oct 26, 26 -**89**

GOVERNMENT regulation of, Schoonmaker *R Gaz* Sep 11-**91**

GRADES, grade crossing question *E News* * July 21-**92**; ruling gradient, Holbrook *R Gaz* * July 27 *Sc Am Sup* * 21 *Tech Q* May -**88**; h. p. to move 1 ton up various, table *St R J* Feb **90**. See also R's, crossings, grade

Railroads, GRAND Trunk, Can., prospects, Tyler addr. *E News* Nov 24, Dec 1-**88.** See also R's, Canada, G. T.

GRAVEL train unloading plant *E News* * Apr 18-**91**

GREAT Britain, and tramway working, ed. *Eng* June 22-**88**; stats. * Sep 26; prospects for '91, ed. Nov 28-**90**; and Prussian, ed. Mar 27; new trunk line scheme, May 15; ed. Sep 11; cost of working, ed. 18-**91**; colonial compared, June 10; a year's working of, ed. Sep 23-**92**

E News in '87, Oct 20; and Am. compared in op. expenses, Dorsey, table, Dec 8-**88,** Jan 11; saloon car, notes from abroad * June 21; cars (comparisons), Ralph, Aug 30, notes, Nov 1-**90**; and Am., ed. July 4-**91**

R Gaz working and management, Findley, Apr 6; ten years of, Oct 12-**88**; and locoms. June 21-**89**; cor. Feb 28-**90**; notes, Turner * Dec 9-**92**; development of, McDermott (full) *Sc Am Sup* * Nov 24; prog., ed. *The Eng* Oct 5-**88**; Findley, Aug 23; prog., ed. Sep 20-**89**; extent, ed. Sep 18-**91.** See also R's, Great No. - West. - London, etc.

GREAT Falls & Canada, n *E News* * Oct 18-**90**

GREAT Northern, England, notes *E News* * Feb 7-**91**; and No. E., profiles *The Eng* Nov 23-**88**; widening works, Lond. to Barnet * July 22 * Aug 5 * Oct 7 * Nov 4, 18, works, Doncaster, insets (very full) * Dec 16-**92**

GREAT Southern & West. works, Inchicore *Eng* * July 27-**88**

GREAT Western, England, widening *Eng* * Apr 1; gauge changing * June 3-**92**; notes *E News* * Feb 21, 28 * Mar 14-**91**; gauge changing and in U. S. Aug 25; broad g. abolition *R Gaz* June 10; change of equip. for change of g. * Nov 4; gauge conversion, map *The Eng* * May 13-27-**92**

GREENOCK & Gourock, Scot. *Eng* * Feb 22, insets * Mar 8-29 * Apr 5-**89**

GUARDS, hours of employment, table *Eng* Feb 20-**91**

HAWAII, building in, Hau *E Mag* * May -**91**

HIGHLAND, West, Scot. *Eng* * Oct 3-**90**; map *The Eng* * Aug 26-**92**

HISTORY, Liverpool & Manchester, Bailey *Eng* * Feb 1; early, h. p. and sails on *E News* May 11-**89**; Camden & Amboy origin and early Dec 12; German studies of Am. *R Gaz* Feb 13, 27, Mar 20 * Apr 3, May 8-**91**; early R. travelling *Littell's* Jan 4-**92**

HOELLENTHAL, abs. *Inst C E* v 92 -**88** *Deut Baus* -**87**

Railroads, HONDURAS No. Coast *E News* June 16-**88**
HUDSON River Tunnel terminal, proposed *R Gaz* * Aug 12-**92**
HUNGARIAN State, pass. tariffs, remarkable expt. *R Gaz* Oct 25-**89**; May 9-**90.** See also R's, pass. rates
HYDRAULIC, Girard's, Paris exhib. *Eng* * Sep 27 *R & Eng* * Oct *Sc Am Sup* * Sep 28, (full) * Nov 2, ed. *The Eng* Sep 20, n * Oct 4-**89** *Industries*
INCLINE plane, No. Hudson Cty. pass. elevators, Weehawken, N. J., inset *E News* * Jan 17-**91**; Lauterbrunnen-Muerren cable * Oct 20; Otis elevating cable, Catskill mts. * Aug 18, inset * Sep 8 *R Gaz* * Aug 12, 26 *St R J* * Sep -**92**; hoists, Arlberg R. *E Rec* * Dec 27-**90**; Fairchild *St R J* * Feb * Mar -**91.** See also R's, Dunderberg — elevated — mt. — Rimutaka — Trincheras, etc.
ILLINOIS Central report, ed. *R Gaz* Mar 22-**89**
INDIAN, in '86, ed. *Eng* Jan 27; frontier * Feb 10; ed. Sep 21-**88**; Mar 15, eds. Oct 4-**89,** Sep 19; extent, charges and cost, Nov 28-**90**; ed. Nov 6-**91**; English practice and in colonies *E News* Aug 4-**92**
Inst C E Bengal & N. W., Rhind, insets * v 91 -**88**; West of, Portuguese, Sawyer, insets; broad and n. g. systems contrasted, Waring, discuss. (full) * v 97, 97-**89**; concrete quarters, Ker, inset * v 101 -**90**; Bengal Nagpur g. conversion, Moyle, v 103 -**91**; notes *R & Eng* Nov -**90**; cor. *R Gaz* July 19, Sep 13-**89,** Nov 21-**90**; cheap service, ed. Dec 25-**91**; notes, Mar 4; provident funds on, Sep 23-**92**; *Sc Am Sup* Aug 24-**89.** See also RAILROADS, Bengal
IRELAND *The Eng* Jan 15-**92**
INSPECTORS forms for reports, Buf., Roch. & Pitts. *E News* May 12-**88**
INTER-Continental (Mex. Cen. Am.), proposed, map *E News* * Sep 6 *R Gaz* * Apr 18, *Sc Am Sup* * May 10-**90**; * Aug 14-**91.** See also RAILROADS, Pan-Am.
INTERSTATE Commerce Commiss., U. S., 3d report *E News* Jan 11, 2d, ed. Aug 23, Sep 27, ed. Dec 13-**90,** report, Jan 16, 23, n Dec 29-**92**; 2d report abs. *R Gaz* Dec 7-**88,** law amendments, Mar 8, 8-**89,** report, Jan 10, stats. Aug 22, ed. 29, Dec 12-**90**; Canada com. and its work, Schoonmaker (full) Oct 16-**91**; stats. Jan 15-**92.** See also RAILROADS, U. S.
INTERSTATE Rap. Tran., cols. foundations *E News* * Apr 21-**88**
ITALY, and steam tramways, Alden *E News* Sep 1-**88**

Railroads, JAPAN, map *Eng* * Aug 9–**89,** ed. Mar 21–**90**; *R & Eng* Jan, Stein, Nov –**88,** map * Sep, n Oct –**89**
JERSEY City terminals, Penn. R., inset *E News* * Sep 26–**91**
KNOXVILLE So. Tenn., piece of difficult location *E News* * May 9–**91**
LA Guaira & Caracas, Heinké, abs. *Inst C E* v 110 –**92**
LAKE Erie. See RAILROADS, N. Y., Lake Erie
LAKE Shore & Mich. So., report and ed. *R Gaz* May 18–**88,** May 10–**89**
LANARKSHIRE & Ayrshire *Eng* Sep 7–**88,** Tait *Inst C E* * v 105 –**91**
LANCASHIRE & Yorkshire, England, notes *E News* * Mar 28–**91**
LARTIGUE single line, in Kerry, n *Sc Am Sup* * Apr 7–**88**
LAW, need for uniformity in, diag., ed. *E News* * Apr 9–**92**; recent and effects, Hadley *R Gaz* Dec 4–**91.** See also *R Gaz* files
LEHIGH Valley, Jersey City frt. terminus, inset *R Gaz* * Sep 4 –**91**
LIBRARY, Prussian Dept. Pub. Works *R Gaz* Nov 8–**89**
LIVERPOOL & Manchester, hist., Bailey *Eng* * Feb 1–**89**
LOCATION, with taper curves, Olmstead *E News* * July 21, 28–**88**; general, with references to sources of traffic, Wellington, Aug 24, Oct 12, 26, Nov 2, field-work cals. Nov 9, 16, 30, Dec 7, 28–**89** * Jan 4, 25, Feb 8; frog, Avery * Mar 22–**90**; curved vs. tangent, Norfolk & West. * Oct 5–**89**
R & Eng principles, Jameson (full) * Jan–Dec –**88** * Jan –**89**; crossings of great rivers, Zdziarski * Aug–Nov –**92**; field practice in west, Beahan *Sc Am Sup* June 23 *J Assoc E Soc, R Gaz* June 8; M'Elroy, July 6; theory, notes on, cor. Aug 3, 10–**88**; and construct. in No. W., notes, Russell, July 15–**92.** See also R's, curves
LOGGING, engine for lumbermen, Teed *R & Eng* Mar –**92**; logging truck, Great No. R. *R Gaz* * June 5–**91**
LONDON, growth, ed. *Eng* June 1–**88**; City & So. Lond. deep tunnel, ed. * Nov 7, 7 * Dec 26–**90**; Central R. bill, Mar 6, 13–**91**; R's terminating in, ed. *E News* Sep 29–**88**; Met., notes * May 2–**91**; traffic, Kemmann, bk. review *R Gaz* Nov 4; Waterloo terminus enlargement, Lond. & So. W. *The Eng* * May 20–**92.** See also R's, underground, Lond.
LONDON, Brighton & So. Coast, England, notes *E News* * Mar 21–**91**

Railroads, LONDON & No. West., England, notes *E News* * Apr 11-**91**; *R Gaz* Oct 18-**89**

LONDON & So. West., England, notes *E News* * Apr 18 * June 13-**91**; widening and imp. works (Met. extension), Szlumper, insets *Inst C E* * v 107 -**92**; Waterloo terminus enlargement *The Eng* * May 20-**92**

LUXEMBOURG, map *The Eng* * Mar 25-**92**

MANAGEMENT, English working and, Findley, bk. review Lond. '89 *The Eng* July 12, 26-**89** *Eng* July 15-**92**; Am., Marlborough *E Mag* June -**91**; course of instruction in, C. F. Allen *R Gaz* Nov 28 *Tech Q* Aug -**90**; Alexander *Scribner's* Jan -**89**; mismanagement (economics), Acworth 19*th Cent* Dec, bks. and articles on R. subjects *Economic J* June -**92**

MANCHESTER, Shef. & Lincoln., proposed extension to Lond. *Eng* May 1, 1, 22, cor. June 5-19; notes *E News* * Apr 25-**91**

MAPS, survey, Low *E News* * Jan 5-**89**. See also R's, U. S.

MARIETTA & No. Ga., map *E News* * Sep 6-**90**

MASS. R. Commiss. reports, ed. *E News* Mar 23-**89**, Feb 21-**91**

MASTER Mechanics Assoc., Am., pro. *E News* June 22, 29-**89**, June 20, 27-**91**; *R Gaz* June 22, 29-**88**, (full) June 21-**89**, June 20, and ed. 27-**90**, (full) June 24-**92**, *The Eng* July 12-**89**

MEXICO, Parsons, insets *Am C E* * v 22, and discuss., Schmidt, n v 23 -**90**; stat., map *E News* * May 3, 3-**90**; ed. *R Gaz* Nov 27-**91**; *Sc Am Sup* * May 31-**90**

MEXICAN Cen. report *R Gaz* May 16-**90**; fuel premiums, Aug 21-**91**

MIDLAND, England, notes *E News* * May 9-**91**; profile *The Eng* Sep 20-**89**

MISSOURI Pacific report *R Gaz* Mar 27-**91**

MOMBASA & Victoria N'Yanza, map *The Eng* * Aug 19-**92**

MOUNTAIN, recent development of rack R's, Kuntze *E News* Apr 14-**88**; construct., Parsons, May 30; Van Zile's traction method for heavy grades * Sep 8; cost of construct. and op., table, Dec 22-**92**

Inst C E bibliog. of papers on (foreign periodicals) and discuss. (full); Laon steep gradient, Brancher, abs; rack vs. adhesion, abs. v 96, 96 -**89** *Genie Civil* * v 13 -**88**; Eiger, n *R Gaz* Aug 12-**92**; Agudio's system, Zanetti *St R J* * Jan * Feb; incline plane and elevated, Fairchild * Feb -**91**; the Hasting's inclined cliff tramway *The Eng* * July 24-**91**. See also ALPINE eng; R's, incline planes — mt., Abt

Railroads, MOUNTAIN, ABT rack R's, on the Bolan R. *E News* June 16; in India, Sep 22-**88**; list of, in world, n June 7-**90**; in world, n Aug 27; Audra, abs. *Inst C E* v 105 -**91** *Genie Civil* * v 19 -**91**; system, n *R & Eng* Nov -**88**, Jan -**89** * Feb -**90**; list, n *R Gaz* Aug 14 *Sc Am Sup* * Aug 15-**91**; Indian expts. with combined adhesion and rack rail *The Eng* July 13-**88**

AUSTRIAN, combined adhesion and rack rail *E News* Feb 2 -**89**

BRIENZ & Rothhorn rack, Preller, inset *Eng* * Nov 11, 18 *E News* * Dec 15-**92**

BRUNIG, Switz. *E News* Dec 15-**88**

BURGENSTOCK wire-rope, Lucerne lake, Switz., Sommerguth, abs. *Inst C E* v 100 -**90** *Zeit deut Ing* -**90**; cable *R & Eng* Aug -**90**; first elec., n *The Eng* Sep 7-**88**

DUNDERBERG gravity, Hudson Highlands, map *E News* * Dec 21-**89**

FLORENCE & Fiesole elec., Sherbner, inset *Inst C E* * v 106-**91**

GENEROSO, Lake Lugano, Switz., abs. *Inst C E* v 107 -**92**

GUTCH, Lucerne, Switz., n *R & Eng* * Sep -**92**

HARTZ, cost of working, R. Wilson *Inst C E* * v 96 -**89** *The Eng* Mar 22-**89**

HOELLENTHAL rack, Baden *Eng* * Jan 30, insets * Feb 6, 27 * Mar 13-**91**

HONG Kong & Victoria Gap tramway *The Eng* * Jan 23, 30, 30-**91**

JUNGFRAU, Switz., projected, King *Eng* * July 4, pneu. *E News* Mar 29 * July 19 *R Gaz* July 18-**90**

LAUTERBRUNNEN-Murren hydr. lift and elec. *The Eng* Oct 7 -**92**

LOOKOUT mt. incline, Tenn., Adams *Am Min* * v 16 -**88** *Eng* * Mar 30 *E News* * Jan 7, abs. *Inst C E* v 92 -**88** *Sc Am Sup* * May 12-**88**

MANITOU & Pike's Peak *Eng* * Sep 4, Hastings, abs. *Inst C E* v 104 -**91** *Sci Am* Jan 24-**91**; *E News* Dec 7-**89**; Abt rack rail system * Apr 19 * Oct 4; *R Gaz* * Apr 4-**90**

MATTERHORN, proposed *R Gaz* * Sep 4-**91**

MONTREUX, Switz. steep wire-rope, Territet-Glion, Strub, abs. *Inst C E* v 96 -**89**

NEVERSINK mt., test, Hering, Aldrich (very full) *El Wld* * May 28-July 30-**92**

Railroads, MOUNTAIN, PASADENA, So. Cal., Ellison *Cal Illus Mag* * July -**92**
PHILA., Fairmount Park proposed gravity, map *E News* * June 21-**90**
PILATUS, Switz. *Eng* * Nov 1-**89**; Frank, abs. *Inst C E* v 92 -**88**; *R & Eng* Sep, Oct -**89**; friction brake *R Gaz* * Feb 13-**91**; n *Sc Am Sup* * Aug 3-**89**
RIMUTAKA incline, New Zeal., Fell system on, Maxwell *E News* Apr 6 *Inst C E* * v 96 -**89**
ST. Gall & Gais mt. road, Preller *Eng* * Dec 16, inset * 30, 30 -**92**
ST. Salvatore cable, Lugano, Italy *E News* * Apr 21, Strub, abs. *Inst C E* v 110 -**92** * *Schweiz Baus* -**92**
SWITCHBACKS, their use and construct., ed. *E News* * Mar 10 -**88**
SWISS rack R's *R Gaz* * Sep 16-**92**. See also names
TRANSANDINE R., Abt rack rail system on *E News* Sep 21 -**89**
TRINCHERAS incline, Puerto Cabello & Valencia R., Venez., Carruthers *Eng* Feb 1 *E News* 23 *The Eng* Mar 1, and discuss., insets *Inst C E* * v 96 -**89**
VESUVIUS cable, Zanetti, n *St R J* * Mar -**91**
VIEGE-Zermatt, Switz. *E News* Oct 10 *R & Eng* * Dec -**91** *Industries*
VISP-Zermatt, Abt *E News* Oct 25-**90**; *R Gaz* Apr 24-**91**
WASHINGTON, N. H., Gruninger, abs. *Inst C E* v 96 -**89**
MULTIPLE dispatch, for exhib. '92 *E News* * Dec 13-**90**; Schmidt & Silsbee's *Sc Am Sup* * Apr 4-**91** *Eng*
NARROW gauge, Hunt Co's *R & Eng* * Nov -**89**; in Europe *R Gaz* Jan 29-**92**; vs. standard gauge, Fukuzawa *Tech Q* * Feb -**89**; Tralee & Dingle light, Ire. *The Eng* * July 15, 22 -**92**. See also R's, New Zeal.
NEW Brunswick and Nova Scotia, map *E News* * Apr 26-**90**
NEW England Roadmaster's Assoc. pro. *E News* Aug 18, 25-**88**; *R Gaz* Sep 2-**92**
NEW Jersey to New England all rail *R Gaz* * Oct 31-**90**
NEW So. Wales, report *Eng* Sep 13, Nov 1-**89**, Jan 23, Oct 9 -**91**, ed. Sep 16-**92**; and tramways stats. *E News* Oct 10 -**91**
NEW York R. Commiss. reports, N. Y. State, bk; terminals imp. *Sci Am* Mar 2, 2-**89**

Railroads, NEW York Cen. & Hud. River, track depressing, Harlem, bids, table *E News* Apr 28, n June 9-**88**; West Shore frt. and ferry terminals, No. River, N. Y. * Nov 21-**91**; n *R Gaz* Jan 10-**90**, report, Oct 16-**91**

NEW York, L. Erie & W., eds. *Eng* Dec 14-**88**, Feb 14-**90**; Jersey C. terminals interlocking plant *E News* * May 23-**91**; report *R Gaz* Nov 29-**89**, ed. Dec 4-**91**, report, Dec 2-**92**

NEW York Rap. Tran. elec. undergr., Sprague *El Eng* * Mar 2, report, Apr 1, May 27-**91**

NEW Zealand, n. g., working with light traffic, Maxwell *E News* Jan 9 *R & Eng* Mar -**92**, abs. *Inst C E* v 106 -**91**

NICARAGUA, situation in, map *E News* * Aug 29-**91**

NOMENCLATURE (terms) in England and Am. *E News* Apr 13-**89**

NORFOLK & West., Ohio extension, map *R Gaz* * Oct 28-**92**

NORTH British, England, notes *E News* * June 27-**91**

NORTHEASTERN, England, notes *E News* * May 23-**91**

NORTHERN Pacific, report *E News* Oct 25-**90**; the Stampede switchback, Cascade div., Huson *R Gaz* * Feb 3-**88**; report, Oct 18-**89**

NORTH London, England, notes *E News* * May 16-**91**

OLD Colony, report *R Gaz* Sep 19-**90**

OREGON R. & Nav. Co's lease, ed. *R Gaz* Mar 9-**88**

PACIFIC R. prob. in 1849, map, ed. *E News* * Feb 16, 16-**89**; and the Gov't., ed. *R Gaz* Jan 27, Feb 3, Engr's report to U. S. Commiss. May 11-**88**; Cen. & Union, driving last spike, Dillon * July 29 *Scribner's* * Aug -**92**. See also R's, Cen. - No. - Union Pac.

PAN-Am., Cen. Am. interoceanic, map *Eng* * Aug 19, 26 * Sep 16 -**92**; Conn *E Mag* * Aug -**91**; *Goldthwaite's Geog. Mag* July -**92**; Inter-Continental (Mex. Cen. Am.) proposed, map *R Gaz* * Apr 18-**90**; Jan 30; Conn, map * May 29; Inter-Con. So. Am. * Aug 14-**91**, map *Sc Am Sup* * May 10-**90**. See also R's Inter-Continental, So. Am.

PARIS, Met. *R & Eng* * Jan -**90**; suburban, Moulineaux line * July -**89** *Genie Civil*

PARIS, Lyons & Med. works *Eng* * Aug 23-**89**

PASSENGER, rates, zone, ed. *Eng* May 22-**91**; zone system, Austria, diags. *E News* * July 12-**90**, and Mass. * Mar 12, Hungary, Acworth 19*th Cent* Dec *Rev Gen Chem Fer* Apr -**92**, see also Mass. R. Commiss. report; rates, Europe, n *R & Eng* Mar -**91**

Railroads, PASSENGER

R Gaz Hungarian State R. rates, July 19, remark. expt. Oct 25-**89**; fares, Austria, ed. May 23, zone tariff, July 25; rates and receipts, ed. Nov 28-**90**; rates, European, Jan 2; fares in Hungary and England, Acworth, Oct 2-**91**

R Gaz study of zone tariffs, Mar 18; traffic in great cities, Croes * Dec 16; transport. in European cities, consul. report *St R J* Feb, May -**92**; traffic, ed. *The Eng* Sep 26-**90**. See also RAILROADS, rates

PENN., Jersey C. terminal station *Eng* * Apr 1-**92** *E News* * Sep 26, Oct 3-**91** *R Gaz* * Dec 12-**90**; report *E News* May 11-**89**, *R Gaz* Mar 9; traffic and expenses, ed. Aug 3-**88**; report, Mar 8; rules, standard code and ed. Oct 25, 25-**89**; reports, Mar 14-**90**, Mar 6-**91**, Mar 4-**92**

PERU & Bolivia, U. S. & So. Am., map *Sc Am Sup* * May 28-**92**

PHILA. & Reading (and B. & M.) *E News* Nov 3; leases, ed. *R Gaz* Feb 19, 26; in N. E. (B. & M. consol.) Nov 4-**92**

PILE-driver, Jameson *R & Eng* * Nov -**89**

PLATFORM, Hollingsworth's revolving pat. *R & Eng* * Aug -**92**; mul. speed, Schmidt & Silsbee's *R Gaz* * Sep 11-**91**. See also RAILROADS, continuous — sidewalk

PNEUMATIC, Judson system *E News* * July 13-**89**; the Goebel * Mar 22-**90**

PORTABLE. See R's, Decauville, Paris exhib. — Lartigue

POUGHKEEPSIE bridge route *R Gaz* * Feb 21-**90**

PROFIT sharing, Jenks *Charities Rev* May -**92**

PRUSSIAN and Brit., ed. *Eng* Mar 27-**91**; State R. report *R Gaz* Apr 5-**89**; management, ten years of, ed. Feb 27-**91**; pass. stats. Feb 5; reduced profits, ed. Mar 11-**92**

QUEENSLAND, Carrus to Herberton *R Gaz* Dec 30-**92**

RATES, zone, ed. *Eng* May 22; R's and the traders, Acworth, bk. review, July 3-**91**; pass., Europe, n *R & Eng* Mar -**91**

R Gaz prins. governing (T. L. Greene) ed. Oct 19-**88**; cost of service as basis of, cor. Mar 29, ed. 29; export, ed. Apr 12; lumber-rate decis., Chic. & Alton, June 7-**89**; food products, Interst. Com. report review, McNeil, July 18, 25, grain and flour, do. decis. Aug 8; pass. and receipts, ed. Nov 28-**90**

R Gaz pass., European, Jan 2; German (small shipments) 16; Hungarian frt., ed. June 5; rates of toll influence on util. of transport routes, Colson and ed. * Sep 4, 4-**91**; England, Acworth, Jan 1, 15; study of zone tariffs, Mar 18; Am. and traffic

Railroads, RATES
The Eng June 10-**92.** See R's, accounts — fares — frt. — pass.
REICHENHALL–Berchlisgaden, Ebermayer, abs. *Inst C E* v 104 -**91**
RICHMOND Terminal, ed. *R Gaz* Mar 25-**92**
RIGHT of way, Hall *R Gaz* May 8-**91**
ROADMASTER'S Assoc. of Am. pro. *E News* Sep 13-**90,** Sep 19 -**91**; *R Gaz* Sep 14-**88,** Sep 19-**90,** Sep 18-**91**
ROLLING stock, Brit. and Am., ed. *Eng* Oct 2-**91**; flex. wheel-bases, Twinberrow *Inst C E* * v 98 -**89**; and track, N. E. R. Club discuss. *R Gaz* Oct 18-**89.** See also CARS; TRACK
RUSSIAN, Timonoff, cor. *Eng* June 29-**88**; Siberian & Finland, Dec 26-**90**
SAFETY appliances, Mich., Rich report *R & Eng* Feb -**88**; ed. June -**89**; national reg. of, Inter-st. Com. Commiss. report. Feb -**90.** See also R's, signals — switches, interlocking
SAHARA, Trans-, pro., Ney, n *R Gaz* Oct 30 *Scribner's* Nov -**91**
ST. Lazare terminus, chem de fer d L'Quest, Paris *The Eng* * Nov 13-**91**
SANDING ap., rail, Bloxham *The Eng* May 18-**88**
SCOTLAND, prog. *Eng* July 11-**90**
SERVICE, elec. lighting in Leonard *E News* July 12-**90**
SHIP. See SHIP railroads
SHOPS, Altoona and Penn. R., ed. *E News* Apr. 26, May 3-**90**; Tacoma, U. Pac. * Feb 20-**92**; design and construct., Barnett, Oct 19, 26, Nov 2-16-**89,** abs. *Inst C E* v 99 -**90** * *Can Soc C E* -**89**; Chic., St. P. & Kan C. *R Gaz* * Feb 10; N. E. R. Club discuss. and ed. on heating shops and mills * Dec 21-**88**; Altoona truck, Penn. * Apr 18-**90**; and yard, Denver, U. P. * Apr 3-**91.** See also BUILDINGS
SIAM, n *R & Eng* * Mar -**91**
SIBERIAN, ed. *E News* Oct 31 *Eng* 16-**91**; Trans-Sib., ed. Aug 12-**92**; proposed, Cunningham, inset map *Inst C E* * v 106 -**91**; Sib. Pac., ed. *R & Eng* Dec -**88**; 1st section, Zdziarski (very full) * June, 2d section * Sep, world R's * Nov, Nov * Dec -**90** * Jan-Mar * July, July -**91**; map *R Gaz* * July 10; Trans-Sib., map *The Eng* * Dec 4-**91**
SIDEWALK, movable, Jackson park, Chic. *Eng* * June 10 *E News* * Feb 27; Hollingsworth's revolving platform pat. *R & Eng* * Aug -**92**; Schmidt & Silsbee's mul.-speed platform *R Gaz* * Sep 11-**91.** See also R's continuous

Railroads, SIDINGS, proper lengths of turnouts for split switches, Byers *Lehigh Eng J* June -**89**; lap, Cleve. & Pitts. *R Gaz* * Dec 26-**90**. See also R's, switches

SIGNALMEN, hours of employment *Eng* Feb 13-**91**

SIGNALS, and signaling, Soule *El Eng* Jan -**90** *R Gaz* Dec 13-**89**; aut. signaling *El Rev Lond* * Dec 30-**92**; ap. on locoms. *Eng* * Nov 22-**89**; elec., Boston *E News* * Oct 26; Soule, Dec 21, 28-**89**; Cen. R. of N. J. Mar 29; and signaling O'Donnell cor. Dec 20-**90**; fixed, uniform practice, com. report, Oct 20 *R Gaz* 14-**92**; evolution of signaling, Koyl *F Inst* * Jan -**90**; in Europe, Gossman *R & Eng* * Dec -**88** * Jan - Apr -**89**, (full) *Rev Chemins*

R Gaz aut., ed. June 15-**88**; Blodgett addrs. Sep 13; Soule * Dec 13-**89**; dwarf, position, Sperry cor. * Nov 28-**90**; imps., Blodgett *Soc Arts Mass* -**91**; insul. resist. of rail circuits, Mann *Tech Q* Apr -**92**. See also R's, switches — tunnel protection

BALT. & O. track standards *E News* * Nov 7-**91**

BLACK'S aut. block *R Gaz* * Jan 24-**90**

BLOCK, Strom aut. elec. safety *El Eng* * Aug 24-**92**; Nichols *El Rev* July 12-**90**; system solution, Leonard * Oct 10 *E Mag* * Oct *El Wld* * 10-**91**; aut., elec. applics. * Jan 9, 16, N. Y. Cen. * 23-**92**; and interlocking in Great Brit. *E News* July 26-**90**; Prov. & Wor. system * Jan 16; what it is, ed. Feb 6; standard rules, Haines, Oct 13-**92**

R Gaz English practice, Farrer cor., ed. * May 31, 31-**89**; Am. practice, May 2-16, June 6, Stewart, 20; Nichols, July 4; U. S. aut. * Nov 7-**90**; Paine, Apr 24; Erie system * Oct 9 -**91**; uniform rules for working, Haines, Oct 14-**92**. See also R's, signals, Black's — Hall's — Kinsman's — Sykes, etc.

BOSTON, Rev. B. & Lynn, Boston interlocked yard, Nat. Sw. & Sig. Co. *R Gaz* * Aug 22-**90**

CHICAGO, Stewart ave. (complicated) crossings *R Gaz* * Apr 24-**91** * Jan 29-**92**

CHICAGO and switches, Mil. & St. P. *R Gaz* * Aug 3-**88**

CLOCK, Blodgett's elec. *R Gaz* * July 27-**88**

COMPENSATORS, n *R Gaz* * Mar 8-**89**; compensated distant, cor. Feb 28; Mitchell & Steven's wire * Mar 7-**90**

DOUGHERTY, the, com. report *F Inst* Oct -**88**

DRAW-bridge, the Kelsey *R Gaz* * June 15-**88**; Thames river interlocking * Feb 14; 3-lever machine * Nov 7-**90**

Railroads, SIGNALS, FRANCE, West. R., Paris exhib. *Eng* * Aug 2, 9, Cen. R. Belgium * Sep 13; No. R. elec. *R Gaz* Feb 21, Mar 7-**90**
FITCHBURG R. aut. *R Gaz* * June 15-**88**
FOG, Drummond's *R Gaz* * Dec 6-**89**
HALL'S aut. block system *E News* * Sep 13, 20-**90** * Jan 24-**91** *R Gaz* * June 13 * Sep 12, N. Y. Cen. * Dec 5-**90**
HAND and lamp *R Gaz* * Nov 9, 9-**88**
HARRINGTON'S semaphore *E News* * Mar 16-**89**
HIGHWAY crossing, Street's *R Gaz* * May 4-**88**; Hall's * Mar 28; O'Neil's, n * July 11-**90**
HYDRAULIC, Paris exhib. *Eng* July 12-**89**
JOHNSON'S, N. Y. Cen. *R Gaz* * Jan 15-**92**
KELSEY gong *E News* * Feb 28-**91**; distant and do. *R Gaz* * June 27-**90**
KINSMAN'S block system *El Wld* * Oct 1, and ed. *E News* * Sep 29 *R Gaz* * Sep 23-**92**
KOYL'S parabolic semaphore *F Inst* * Jan * Aug -**89**
LAMPS *R Gaz* * Nov 9-**88**; A. H. Johnson * Oct 24-**90** *Inst C E*
LIVERPOOL, Lan. & York. Exchange station *The Eng* * Aug 2 -**89**
LOCK-and-block, with aut. treadles *Eng* * Nov 18; Lattig's lock *R Gaz* * Dec 30-**92**
LONG'S elec. semaphore *E News* * Dec 1 *R Gaz* * Nov 30-**88**
PNEUMATIC, West'gh. interlocking system *R Gaz* * Dec 21-**88**; elec. selector for * Nov 14-**90**
ST. Gothard ap., Cox, abs. *Inst C E* v 95-**89** *Zeit deut Ing* -**88**
SEMAPHORE, the parabolic, Stockett *Lehigh Eng J* June -**89**; illum., Union Sw. & Sig. Co. *R Gaz* * Mar 30; showing color at night * Oct 19-**88**. See also R's, signals, Koyl's—Long's
SIEMEN'S elec. ap. *El Rev Lond* * Apr 15-29-**92**
SYKE'S block ap., N. Y. Cen. *E News* * Jan 23-**92**; *R Gaz* * Oct 3-**90**
TORPEDO-placing machine, aut., Nat. Sw. & Sig. Co. *E News* * May 23-**91**
TRAIN, tail lights, ed. *R Gaz* * June 29-**88**; Grigg's elec. air * June 7-**89**; Johnston elec., n * Jan 31-**90**
WATERLOO station, Land. & So. W. *Eng* * May 27 * June 24 * Sep 16 * Oct 28 *E News* * June 23, inset *R Gaz* * Dec 16 *The Eng* * July 29-**92**

Railroads, SIGNALS, WEBB & Thompson's staff ap. *Eng* * May 9 *E News* * Mar 29, N. Y., N. Haven & H. *R Gaz* * Aug 1 -**90**
WISE's train staff system *E News* * June 23-**88**
YARRINGTON's train order *R Gaz* * Oct 24-**90**
SIMPLON, projected, map *E News* * Nov 1-**90**
SIND Pishin *Eng* * May 25, cor. Aug 17-**88**
SLIDING, chemin de fer Glissant, Paris and ed. *E News* * Aug 31, Oct 26, 26-**89,** Barre, abs. *Inst C E* v 100 -**90,** *Soc Ing Civils* Jan -**90,** Galton *Sc Am Sup* * June 7-**90,** (full) *Soc Arts Lond.* See also R's, Glissant-hydr., Girard's
SNOW excavs. and ploughs, rotary shovel *Eng* * Apr 5-**89**; dimens., standard, N. Y. Cen. *E News* * Nov 9; work of rotary, Aug 17-**89**; Russell concave, Intercol. R., inset * July 12 -**90**; snow on R's, Harkom * Dec 29 *Can C E, R Gaz* Nov 18 -**92**
Eng Jull's centrif. excav. * Aug 30 *E News* * Mar 30, Apr 27-**89,** work of, Feb 22-**90,** abs. *Inst C E* v 96 -**89** *R Gaz* * Mar 29, cor. Sep 20-**89,** Feb 21, rotary, trials * May 23, and Otis, cor. * 30-**90**; ploughs, Denmark, Buron *Inst C E* v 91 -**88** *Rev Gen Chem* * Aug -**87**; Judd's rotary steam, Miller *Lehigh Eng J* Apr -**88**
R Gaz the Nevens snow flanger, Maine Cen. * Feb 3; Cox's * Apr 6; rotary steam (full) * 20; Leslie's rotary shovel * Oct 12 * Dec 15-**88**; ploughs, No. W. R. Club discuss. Jan 11; the Cyclone, Apr 26 * May 10-**89**; the Russell * Oct 23; rotary steam wheel shovel * Dec 25-**91**; Gen. Elec. Co's snow sweeper *Sc Am Sup* * Dec 31-**92**
SNOW sheds, Can. Pac. Keefer, insets *Am C E* * v 19-**88** *E & Min* * Mar 2-**89,** Stoess *E News* * Jan 21-**88**; protection from slides, Selkirk mts., Can., Cunningham, abs. *Inst C E* v 94-**88** *Can Soc C E* 2 -**87,** A. Frank *Zeit deut Ing* -**88**
SOUTH Australia *E News* Feb 7-**91**
SOUTH Eastern, England, notes *E News* July 4-**91**
SPAIN, practice, 20 years of *E News* Dec 13; Monte Generoso, abs. *Inst C E* v 101 -**90** *Schweiz Baus* -**89**
SPEED, train, registering ap. *E News* * Mar 5-**92**; Sabouret's measuring ap. n *Sc Am Sup* * Aug 9-**90**
SPEEDS, train, express, ed. *Eng* Aug 23-**89**; past and future, ed. *E News* Nov 7-**91**; higher, McAlpine, Nov 17-**92**; fastest on record *Locom* Aug -**88**; Banderali *R & Eng* July -**89**

Railroads, SPEEDS

R Gaz English and Am., ed. Feb 28, 28; inertia and vels. of at different speeds, table * Oct 31-**90**; latest fast long dist., Phil. & R. and others * Sep 18-**91**; highest recorded * Mar 11; high, conditions affecting, McAlpine, Nov 18; 100 miles per hour, ed. (full) Mar 18, Forney *Scribner's* -**92**; practical limit of *Sci Am* Oct 20; table, n *The Eng* May 4-**88**. See also LOCOMS. trials, performance

GERMANY and continent *E News* Nov 2-**89**

GREAT Britain, West coast fast run, England, ed. *E News* Sep 15 *R Gaz* Aug 10; notes, Aug 12, 19, Sep 2, 23-**92**; Edinb. fast *Sc Am Sup* Sep 29; fast, Great No. *The Eng* Mar 9: fast long dist. runs, a flight on the West coast, Aug 24, 24; the race to Edinburgh, profile Lond & N. W. Sep 14, Oct 12, Great No. and No. E. Nov 23-**88**

U. S., Am. fast, ed. *Eng* Sep 25-**91**; C. B. & Q. fast *E News* Dec 15-**88**; Phil. & R. Dec 8-**92**; Am., table, N. E. R. Club discuss. *R Gaz* Sep 14, Oct 19-**88**; latest fast long dist., Phil. & R. * Sep 18-**91**; fast, Empire State express, Apr 15-**92**; fast pass. *Sci Am* Sep 8-**88**; table *Sc Am Sup* July 27-**89**; Am. fast time *The Eng* Aug 31-**88**; table, June 21-**89**; high, ed. Oct 16, 23-**91**

SPIKES, track, and lag screws holding power, Cox, expts. *E Rec* Nov 14-**91** *R Gaz* Nov 27-**92**; * Dec 27-**89**, Oct 3-**90** * Mar 6; adhesion of, Howard (full) * May 1; the Greer * Dec 11, test *E News* * Mar 19-**92**; tripartite, Pat. Nut & Bolt Co. *The Eng* * Aug 16-**89**

STATION indicator, the Allison *E News* * Feb 14-**91**

STATIONS, elec. lighting *Eng* Dec 13-**89**; picturesque suburban, Gilbert *E Mag* * Dec -**91**; small, standard plans, N. Y. Cen. *E News* Mar 31; suburban * Aug 4, 25; Cen. R. of N. J. * Oct 6 -**88**; minor structures, Can. Pac., inset * May 24, 24-**90**; Macon & Birm. standard, inset * May 26-**92**; and yards, design of, Parkinson * Nov 29, inset *Inst C E* * v 102 -**90**; Balt. & O., inset *E Rec* * Dec 21-**89**; Mex. Nat. terminal proposed, inset *R Gaz* * May 9-**90**

BAY City, Mich. Cen. *E News* * Dec 27 *R Gaz* * 26-**90**

BOSTON, Boston, Rev. B. & Lynn pass. *R Gaz* * Aug 1 -**90**

BRENTOR, Plymouth & So. W. Junct. R., England *The Eng* * May 30-**90**

Railroads, STATIONS, CHICAGO, Union Transfer *E News* * Feb 8-**90**; and So. Side Rap. Tran. *R Gaz* * Apr 11-**90**; exhib. terminal * Sep 23; 12th st., Ill. Cen., inset * Oct 14-**92**
COLOGNE, Germany, trainshed *E News* * Oct 6-**92**
DETROIT, Mich., Fort st. union, inset *E News* * Jan 31-**91**
DULUTH Union, inset *E Rec* * Jan 2, construct. * Feb 6, 6 * Mar 12-26 * Apr 9, 23 * May 21-**92**
DUNDEE, Caled. R., insets *Eng* * June 14, 28-**89**
EDINBURGH, Princes st., Caled. R. *Eng* * Sep 30-**92**
FALL River, Mass. (Bowenville) Old Col. *R Gaz* * Feb 27-**91**
FORT Payne, Ala., pass., Ala. Great. So. *E News* * Sep 12-**91**
FRANKFORT-on-Main Cen., Germany, bk. review *E Rec* * Jan 18-**90**, Union pass., insets (full) * Sep 5-26 * Dec 5-**91**, train shed erection * Mar 5; arrangements, Wegele, abs. *Inst C E* v 110 -**92** *Zeit Bauwesen* -**92**. See also BUILDINGS
INDIANAPOLIS Union *R Gaz* * Jan 31-**90**
JERSEY City train shed, Penn. R. *E News* * Dec 27-**90**, inset *R Gaz* * Oct 2-**91**
LISBON, Pitsch, abs. *Inst C E* v 103 -**91** *Genie Civil* * v 17 -**90**
LONDON, & So. West. suburban *R Gaz* * Sep 19-**90**; St. Pancras frt., Midland R. * July 6 *The Eng* Apr 6-**88**
LOUISVILLE, Ky. terminal, L. & N. *E News* * July 25-**91**
MONTREAL terminals, Can. Pac. *E News* * Mar 3, arches and retaining walls, 17 *E Rec* * Jan 7 *R & Eng* Feb -**88**
NEWARK, N. J., pass., Penn. R. *E News* * Feb 14-**91**
NEW York city, Harlem Depression R. overtrack, inset *E News* * Feb 8, 15; Grand Cen. *R Gaz* * May 16-**90**
OMAHA, Neb., union, proposed *E News* * Aug 17-**89**
PARIS, France, St. Lazare terminus, chem. de fer d L'Ouest *Eng* * July 12, 19-**89** *The Eng* * Nov 13-**91**
PERTH, Scot *Eng* * Aug 16-**89**
PHILA., Broad st. terminal, Penn. R. *E News* * Oct 6, 13 *R & Eng* * Nov *R Gaz* * Sep 30 * Oct 21-**92**
PITTSBURG, train shed, B. & O. *E News* * Feb 23-**89**
PORTLAND, Me., Union, inset *E Rec* * Nov 30-**89**
PROVIDENCE, R. I. terminals, the Cove *E News* * Apr 27-**89** * Aug 2-**90**
RYE, N. Y., N. Y., New Haven & H. *E Rec* * Nov 23-**89**
ST. Louis, Mo., Union pass., train shed *E News* * Oct 3-**91** * Apr 2, insets 21, 28-**92** *R Gaz* * July 24-**91**
SPRINGFIELD, Mass. pass., B. & A. *R Gaz* * Mar 14-**90**

Railroads, STATIONS, TAVISTOCK, Plymouth & So. West. J. R. *The Eng* * June 13-**90**

STOCKS and coal, prices '88 *E & Min* Jan 12-**89**

STOP, Rowell-Potter aut. safety *E News* * May 11-**89**, Boston, Rev. B. & L., Oct 20; Fox emergency, n *R Gaz* * July 8; stopping from 90 miles per hour, cor. Sep 23-**92**

STREET. See STREET railroads

STRIKES prevention, ed. *R Gaz* Mar 29, C. F. Adams *Scribner's* Apr -**89**

SUMATRA *E News* Nov 16-**89**; W. Coast State, Kuntze, abs. *Inst C E* v 105 -**91**, Post, abs. v 107 -**92** *Zeit deut Ing, Rev Gen Chem* July -**91** *R & Eng* * Nov -**91**; Queen's Bay & Oembilin, map *The Eng* * Apr 22-**92**

SUPERINTENDENT'S daily summary of reports, tables *R Gaz* Aug 3-**88**

SUPPLIES, purchasing and care of *R Gaz* Feb 14, 21, Mar 14 -**90**

SURVEYING, surveys and resurveys Paul *E News* Sep 12-26; slope stake setter and universal indic. * 12-**91** *The Compass;* use of the stadia in, J. B. Johnson *R Gaz* Feb 3 * Mar 2, 9, 30; camp and field life on U. P. surveys, Middleton *Sc Am Sup* July 7-**88**. See also SURVEYING

SWEDISH, Koersner *Eng* Jan 6, Sandberg, 13; 25-ton iron ore wagon *The Eng* Apr 27-**88**

SWITCHBACK, the Stampede, No. P., Huson *R Gaz* Feb 3-**88**

SWITCHES, Dailey aut. cut-out *E News* * Mar 26; point, B. & A. 31; sig. system, Elizabethport station * Nov 24-**88**; Price frogless * Apr 6; safety lock, Lehigh Val. * June 15; slip, or combination cross over, Cincin. * Nov 16-**89**

E News aut. cam lock * May 24; Dunn safety * Aug 23; prog. in interlocking ap., Union Sw. & Sig. Co. * 23; and frogs, experience with, Ellis * Sep 6-**90**; turnouts, functions of, Washburn, inset *R & Eng* * Oct -**89**; 3-rail turnouts for double gauge tracks, Geddes (full) * Apr-July -**92**

R Gaz interlocking ap., Long Is. R. * Feb 10; and sigs., interlocked, C. R. Johnson, May 4, 18, June 8, July 27; German, movements * Aug 10-**88**; slip, with movable frog, Un. Sw. & Sig. Co. * July 12-**89**; sliding and Parson's frog, Brooklyn br. R. * Jan 24-**90**; and frogs, Ellis, May 29; interlocking machinery, Hall Sig. Co. * Sep 25-**91**; interlocking, Wuerpel mach. * Sep 16-**92**

Railroads, SWITCHES, BAY City Junct., Detroit, Mich. Cen., interlocking *R Gaz* * Nov 14-**90**
BOSTON & Albany standard *R Gaz* * Mar 2-**88**
DRAW-bridge interlocking plant, N. Y., Pa. & O. *R Gaz* * Jan 10-**90**
JERSEY City, terminus, Erie R., interlock., inset *R & Eng* * June -**91**; yard, Cen. R. of N. J., Un. Sw. & Sig. Co. *R Gaz* * June 28-**89**; N. Y., L. Erie & W. * May 22; pneu., Penn. R., Sperry * July 31-**91**
JOHNSON interlocking mach. *R Gaz* * Jan 18-**89**
KELSEY & Stevenson's aut. *R Gaz* * Feb 13-**91**
NEW York, Grand Cen. station interlocking *R Gaz* * Dec 27 -**89**
PARSON'S block & sig. system *R Gaz* * Aug 16-**89**
ROBINSON-Wharton *R Gaz* * Sep 21-**88**
ST. Louis Br. & Junct. R. interlock. system, Eayrs *R Gaz* * Feb 8-**89**
SALEM, Mass. tunnel, interlock. *R Gaz* * Feb 22-**89**
TELEGRAPH supts. pro. *El Rev* Oct 26 *El Wld* 26-**89**. See also TELEGRAPH
TEXAS frontier, building, Rafter *E Mag* * Oct -**91**
TICKETS, Cin., Wabash & Mich. *R Gaz* * Mar 13-**91**; Chic. & Alton * Jan 22-**92**
TIES. See CROSSTIES
TIME, unpunctuality, English, ed. *Eng* Dec 16-**92**; general time convention *R Gaz* Oct 12-**88**. See also TIME
TRACTION, h. p. of tabulated constants for det., Crane *El Eng* Nov 19-**90**
TRAFFIC, Am. and English *Eng* Jan 1-**92**; suburban, Booth *R Gaz* Dec 13-**89**, Jan 24-**90**; Chic. east-bound, Apr 10 -**91**; interchange facils., Godkin, Jan 29-**92**; and earnings, ten years growth, ed. Nov 13 *The Eng* 13-**91**; U. S. *R Gaz* files
TRAIN dispatching, op. of, safety systems, ed. *E News* Oct 12-**89**; graphic record, diag. * Sep 5-**91**; duplicate order system *R Gaz* Jan 10; Kinsman, July 4; Am. system, ed. 25-**90**
TRAIN indicator, standard, Rich. & Dan. system *E News* * Feb 9-**89**
TRAIN lighting, elec. *E News* Apr 7-**88**, Seldon, Nov 2-**89**; Timmis' system *The Eng* Apr 13-**88**. See also CARS, lighting

Railroads, TRAIN resistance, air, expt. study, Crosby *Eng* May 30 * June 6, 13-**90**; the grain of sand on the track, Field *El Rev* Apr 30-**92**; expt. study, Crosby (full) *El Wld* * May 24-**90**; and power * June 18; high speed, July 9-**92**; early expts. *E News* Sep 1, and air resist., ed. 1; laws of, Oct 6, ed. 27; C. B. & Q. (valuable) report, diags. * Nov 17, 24-**88**; Desdouits expts. *R & Eng* Apr -**91** *Inst C E*

R Gaz No. E. R., England, ed. * Mar 28; air resist. at very high vels., Chanute cor. Dec 26-**90**; locom. cyl. power consumed ahead of first car * June 17-**92**; Slack *Steven's Indic* July 15-**88**; *The Eng* Apr 6, Sep 21, 21-**88**, ed. Mar 14-**90**. See also AIR; ATMOSPHERIC resist.

TRAINS, vibrations instruments, Milne *Eng* Oct 11-**89**; colliding, destructive force of, cor. *E News* Aug 4, 25, Adams, Sep 8 **88**; length increase on Austrian R's * Mar 22-**90**; sanitary *Sc Am Sup* * Jan 21-**88**; articulated rolling stock, Paris, Sceaux & Limones R. *The Eng* * Nov 21-**90**; speeds, see R's speeds; stop, see R's stop

TRANSANDINE, Argent. Repub. & Chili *Eng* * Sep 19-**90**, tunneling plant, inset * Apr 24 * May 22-**91**; map *E News* * Oct 25-**90** * Feb 13-**92**; Child *Harper's M*, *R & Eng* Dec -**90**, n Jan -**92**, *R Gaz* * Oct 17-**90**, *Sc Am Sup* * June 20 -**91**

TRANS-Caspian, Rymkienicz, map *E News* * Sep 29-**88**; and territory, Heyfelder, abs. *Inst C E* v 92, Strukel, abs. v 94 -**88**; *R Gaz* Jan 3-**90**; *Sc Am Sup* * Feb 11-**88**

TRANS-Caucasian *E News* Feb 11-**88**

TRANSFER-tables, N. Y. Cen., inset *E News* * Dec 21-**89**; elec., Fitchburg R. shops *R & Eng* * Feb -**90** *R Gaz* * Dec 6; Penn. (full) * Mar 22-**89**

TRANSPORTATION, N. E. and Middle stats, Cen. stats. *E News* Nov 14-**91**

TRANS-Siberian, ed. *Eng* Aug 12 *Sc Am Sup* * Jan 30-**92**, map *The Eng* * Dec 4-**91**; world, map *R & Eng* Nov -**90**. See also R's, Siberian

TRESTLES. See TRESTLES

TUNNEL protection, block system, cor. ed. *R Gaz* Mar 13, 13 -**91**

TURKEY, Asiatic, construct. *E News* * Dec 15-**92**

TURNOUTS. See R's, sidings - switches

Railroads, TURNTABLES, Silverton R., Col., Gibbs, discuss. *Am C E* * v 23 -**90**; and traverser, St. Lazare station, Paris *Eng* July 19; Paris & Or. R., Paris exhib. * Nov 15-**89**; wrt. iron deck *E News* Dec 21-**89**; wrt. iron * Jan 4-**90**; Jameson *R & Eng* * Oct -**89**; 60-ft., for 100-ton locom. *R Gaz* * Feb 28-**90**; standard, Passaic Rolling Mills Co. * Feb 5; for Howe truss draw-br., Fraser river, Can. Pac., Cambie * Nov 25 -**92**

ULEABORG, Finland, Strukel, abs. *Inst C E* v 92 -**88**

UNDERGROUND. See also Rap. Tran. Commiss. report to Mass. Legislature, Apr 5-**92**; TUNNELING, Great Head system; TUNNELS

BALTIMORE Belt, insets *E News* * Dec 12, 19-**91**, York road tun., inset * Jan 9-**92**

BLANC system of subway structure for city sts. *El Wld* * Mar 22-**90**

GLASGOW Cen. *Eng* * Oct 5-**88**, May 30-**90**, map * May 27 * June 3 * July 1, 15, inset * 22 * Aug 5, inset * 19, 19-**92**; and Dist. covered way, W. Wilson *Inst C E* * v 92 -**88**; building *R & Eng* * Sep -**92**

LONDON, Central R., proposed, bill *Eng* Mar 6, 13-**91** *The Eng* July 11-**90**, bill, Mar 6, 13, Islington, 20, 27-**91**

CITY & So. Lond., elec. locom. *El Eng* * Nov 26, subway *El Rev Lond* * 7-**90**; files -**91**; Grindle, July 29, Aug 12, and cable, Sep 16-**92**; *El Wld* * Nov 29; deep tun., ed. *Eng* * Nov 7, 7 * Dec 26; *E News* Nov 29-**90**; *R & Eng* * Jan; subway *R Gaz* Dec 11-**91**; report, Mar 4-**92**; Southwark subway *Sc Am Sup* * Oct 11-**90** *The Eng* * June 7-**89**; * Nov 7-**90**

METROPOLITAN, notes *E News* * May 2-**91**, n *The Eng* Jan 27-**88**; tunnel purification, Jan 29-**92**

NEW York city, elec. rap. tran., Sprague *El Eng* * Mar 4, report, Apr 1, May 27; Reno elec. proposed, map *El Wld* * Feb 14 * June 20; Met. Co's tun. under East river, inset *E News* * Mar 14-**91**; rap. tran. plans (full) *E Rec* * Nov 26 * Dec 3-17; Met. (full) *The Eng* * Jan 22-**92**. See also RAPID transit, N. Y.

PARIS elec., n *El Rev* * Jan 30-**92**; Met. R. subway construct. *E News* * Dec 13-**90**, n *Sc Am Sup* * Jan 3-**91** *Genie Civil*

PHILADELPHIA, feasibility of, Haupt *F Inst* Dec -**88**

Railroads, UNION Pacific, geography of eastern end, Ainsworth *R Gaz* May 4-**88,** report, Apr 26, traffic, July 5-**89**; U. S. and, com. reports, Feb 21, May 2, Oct 17-**90,** Oct 16-**91**; May 13; & Cen., driving last spike, Dillon * July 29 *Scribner's* * Aug -**92**

UNITED States of Am., see Poor's Manual of R's, **88-92,** bk; stats., ed. *Eng* Aug 15; visitor's impressions, Nov 28-**90**; Poor's Man. review, Oct 7-**92**; decline in building, Greene *E Mag* Feb; in So. West., Coleman, insets * Apr -**92**

E News No. West. states, inset map No 5 * Jan 28; So. West., inset map 6 * Mar 3; far West., colored inset map * 31, 31; in '86-7, prog., inset map 9 and ed. * June 16, 23, 23; in 1831 and record of 1887, Sep 8, 8; states east of Chic., col. inset map, ed. * Nov 10, 10, 24; and English, compared in op. expenses, Dorsey, table, Dec 8; track laid in '86-7 and 8, col. inset map, ed. * 29, 29-**88**

E News Southern states, col. inset map, ed. * Feb 2, 2; construct., states east of Chic., prog., col. inset map, ed. * Mar 30, 30, Apr 6; growth, col. inset diag., ed. * 27; No. West., col. inset map, ed. * May 11, 18; minor No. West. systems, ed. June 1; Southern, col. inset map * 15, 15, ed. 22; So. West., col. inset map, ed. * July 20, 20; construct. 27; No. West., col. inset map, ed. * Aug 3, 3; in '88, Poor's Man. bk. review, ed. 17, 17, state commissions' reports, ed. 24, 24; far West., col. inset map, ed. * Sep 7 * Nov 30; So. West. col. inset map, ed. * Sep 28, 28; Rocky mts. and Pac. states, ed. Nov 30; construct. of four years, col. inset map * Dec 28, 28-**89**

E News smallest Am., Monson, Me. Feb 22; construct. in '90, col. inset map * Mar 1, 1; construct., states east of Chic., col. inset map, ed. * Apr 12, 12; Southern, col. inset map, ed. * June 14, 14; No. West. construct., inset map * Aug 2, 2; in '89, Poor's Man. bk. notice, 2; No. Minn. construct. Sep 13; So. West. construct., inset map, ed. * 27, 27; Rocky mts. and Pac. states, ed. * Nov 29, 29; construct. of '90, ed. Dec 27-**90**

E News in '90 and for five years, inset map, ed. * Jan 3, 3, Aug 8; in '91, inset map * Feb 28; states east of Chic., inset map * Apr 11; in South, stats., inset map, ed. * June 13, 13; and English, ed. July 4; No. West. construct., inset map * Aug 1, 1; So. West. do., ed. * Oct 3, 3; far West., inset map * Nov 28-**91**

E News mileage laid in '91, inset map * Jan 23; construct. of '91, inset map * Mar 5, 5; states east of Chic., inset map * Apr

Railroads, UNITED States
9; Southern, inset map * June 23; prog. '91, Poor's Man. review, July 28, 28; No. West., inset map * Aug 4; So. West. prog., inset map * Oct 13; far West. construct., inset map, stats. * Dec 8, 8-**92**

R & Eng stats., Poor's Man. introd. review, Sep -**89,** Sep -**90**; stats., Sep, do. Interstate Com. 3d report, Adams, Feb -**92**; building in '87 *R Age, Locom* Jan -**88**; in '90, Poor's Man. review, Apr -**92**

R Gaz new construct. '88, tables, June 1, 8; mileage, ratio of pop. to, White cor., diag. * Oct 5; Interstate Com. 2d report abs. Dec 7-**88,** stats. do., ed. Jan 18; construct. in '89, table, ed. Apr 19, 19; in '88, Poor's Man. review, ed. Aug 16-**89**; net earnings '89 (and prices) Feb 28; construct. Jan – July 4, in '90, 18, in '89, Poor's Man. review, ed. Aug 1, 1-**90**

R Gaz construct. Jan -**90** – Jan -**91,** table, ed. Jan 2, Jan – July -**91,** ed. June 26, 26; in '90, stats., Poor's Man. review, ed. Aug 7, 7; stats., census, ed. Nov 6; traffic and earnings, ten years' growth, ed. 13-**91**; construct. in '91, table, Jan 1, Poor's Man. review, ed. July 29, 29, Gov't. stats. and world's, Dec 16, 16-**92**; ten years' growth, ed. *The Eng* Nov 13-**91**; in '91, Oct 28-**92.** See also R's, Interstate Commerce Commission reports

VICTORIA, New So. Wales *Eng* Nov 14, 28-**90,** Jan 30 * Mar 6 Apr 10-**91**

VIENNA City proposed extensions, abs. *Inst C E* v 107 -**92** *Woch ost Ing* -**91**

WABASH report, English *R Gaz* Dec 19-**90**

WASHOUTS, Parsons *R Gaz* * Apr 20-**88.** See also R's, accidents

WATER stand pipe, the Sheffield *E News* * Mar 19-**92**; water tank, U. P. *R Gaz* * Sep 5-**90**

WHEELING Union Bridge *R Gaz* *July 11-**90**

WRECKS, outfits for handling, Hynes *R Gaz* * Dec 5, 19-**90** * Jan 9, 23, Feb 13, 27, Apr 17-**91**

YARDS, Columbus, O., Penn. R. *R Gaz* * Mar 25, 25-**92.** See also R's, stations

YUCATAN, E. Thompson report *E News* Dec 15-**88**

Rails, flat-topped and cyl. wheels, Whittemore *Am C E, R Gaz* Jan 25; destruction by excessive wts., discuss., Dodge *Am C E* v 20 -**89**; rolling steel, Nicholson *Am M E* * v 11-**90** *E News* * May 3-**90**; manuf. conditions influencing life in service, Delano *Am Min* * v 16 -**88**; steel and specs. for manuf.,

Rails

R. Hunt * v 17 -**89** *E & Min* * Oct 27, Nov 3 *E News* * Dec 1-**88**; wear of as related to their section, Dudley *Am Min* * v 18 -**90**

Eng use of heavier, Sandberg, Feb 8-**89**, steel, do. Aug 1, 1 * 8; rail profile tracing ap., Schilling * Sep 19 *R Gaz* * Oct 10-**90**; devel. Am. rail. and track, Watkins *Eng* * July 1, 22 * Aug 12 * Sep 23 * Oct 14, 21-**92**

E News wear of, in India, ed. Jan 21; fastening and track Inter-St. Rap. Tran. Co. * Apr 28; manuf. cost at Edgar Thomson steel works '87, Scott, n June 9; a practical system of tests, ed. July 21; the Dill nut lock * Sep 1; and wheels, relations, report * Nov 3-24-**88**

E News German stats. Jan 12; manuf. cost in Penn. and England, comparative, Schoenhof, Consular report, Feb 9; por table saws * Feb 23; hardness of inside and outside, compar. tests and ed. * Apr 13, 13; and wheels, relations, Am. C. E. com. report * June 22; consumption, Tratman, July 20; fastenings, Penn. R. * May 11, Venezuelan R's * Aug 3, Cox tie-plate * Nov 23; conditions in manuf. which influence life of, Sep 21; and tires wear, N. E. R. Club pro. * Oct 19-**89**

E News Cito & Funck's lifting device * July 12; steel, chem. and mechan. considered, Sandberg, Aug 23, discuss., insets (full) *Inst M E* * July *R Gaz* Aug 15, 29 *The Eng* Aug 1, 8; foreign practice and tests *R Gaz* Aug 23; wear of different grades, Post, Neth. R's Apr 26, in Swiss tunnels, n Oct 11-**90**

E News 100-lb steel, Penn. R. * July 21; rail and chair, Lond. & No. W. * Sep 1; continuous (1100 ft.), expansion, Moxham, ed. * Oct 27, 27-**92**; use of heavier, Sandberg, inset, abs. *Inst C E* * v 95 -**89**; rusting in tunnels, Thorner, abs. v 99 -**90**; wear of steel, Busschere (full) *R & Eng* * Nov -**89**; 80-lb. standard, Lehigh Val. * Jan -**91**

R Gaz steel, manuf. and life, Delano, Aug 10; specs. for manuf., R. Hunt * Oct 26; 80-lb., Mich. Cen. standard * Dec 7 -**88**; specs., tests and inspection, cir. replies * Jan 18, 25 * Feb 15; heavy, Sandberg, 15; rail flangers, N. W. R. Club * 15; breakages and splices, cor. Mar 8; form of rails and wheels, reports * May 17, June 28; Goliath rail, Sandberg * July 26, base plate, do. * Sep 20; elec. welding of, Ries, Sep 27, cor. *St R J* Oct; steel, rolling, Nicholson *R Gaz* * Nov 22; the Hambay clip and detector bar * Dec 20-**89**

Rails

R Gaz 80-lb., Erie standard * Jan 31; tests of stiffness, P. Dudley, Feb 28; fastening to ties, Wrenshall * July 18; hard or soft, ed. 10-**90**; abrasion and endurance, notes, Howard, Jan 23, 30; 95-lb., B. & A. * Mar 13; steel, cost, May 22; deflection, track expts., Howard * July 3; hard, P. Dudley * Nov 6-**91**; chair and flange rails, compar. study, Freund * Aug 5-**92**; wear of, see METALS, wear of

FROG, spring, Penn. Steel Co., '88 *E News* * Dec 15-**88**; the Monarch spring * Apr 25-**91**. See also Rs, frogs – switches

JOINTS, splice-bars and specs. for manuf., R. Hunt *Am Min* v 18 -**90**; Sandberg's *Eng* * July 26-**89**; N. Y. Cen. *E News* * Apr 21; Dill nut lock * Sep 1; Foster bridge, Oct 6; Den. & Rio Gr. standard * 13; Fisher br. imps. * 27-**88**; adjust. panel, Pough. br. * Feb 23; the Thomson * June 1; rail joint question, ed. * Dec 28-**89**

E News N. Y., L. Erie standard * Sep 27; Weber joint tests, Roadmaster's Assoc. * Dec 20-**90**; the Patterson * Feb 21; B. & O. standard and 85-lb rail * July 18; the Heath * Sep 19; rail and splice-bars, N. Y., N. Haven standard * Oct 3-**91**; splice-bar, Fall Brook Coal Co. * Mar 5; Indian State R's * Dec 29-**92**; fish plates tests at freezing temp., Buel *E Rec* July 4-**91**; Soule's *R & Eng* * Oct -**89**; Connell's, Churchhill's pats. * Mar -**91**

R Gaz 3-tie, with Bush's interlocking bolts, N. Y. Cen. * Mar 30; Penn. R. * Apr 6; L. Shore & Mich. So. 48-in. standard * Nov 30-**88**; 3-tie angle splice, bush bolt, N. Y. Cen. Apr 12; 70-lb, Sav., Fla. & W. * May 17; Goliath, Sandberg * July 26-**89**

R Gaz and chair, Lond., Br. & So. C. * Feb 7; splice-bars specs., R. Hunt, Aug 15; recent * Sep 26; the Clark-Fisher * Oct 17-**90**; track joints, table, Ellis, Aug 28-**91**; French, Mussy * Apr 1; Scaife, Oct 14; the Price * 14-**92**

SECTIONS, Whittemore and com. report (very full) *Am C E* * v 21 -**89**, standard, com. prog. report, insets * v 24-**91**, sheet of designs, ed. *E News* * Feb 21, 28 * Mar 21, 21, inset *R Gaz* Feb 20-**91**; Delano, proposed, R. Hunt *Am Min* * v 17 -**89**, heavy *Eng* Mar 22 *E News* June 8 *R Gaz* * June 7-**89**; wear of as related to sections, system of in series, Dudley (full) *Am Min* * v 18, 18-**90** *R Gaz* * Aug 15-**90**

E News various designs, Hawks, ed. Mar 9, 9; and wheels, forms of * May 11, proper relations of wheels to, report, July

Rail SECTIONS
6; standard, ed. Aug 3-**89**; flat top, suggested, Churchward, n * Nov 22-**90**; form of, Gunn cor. * May 23-**91**
R Gaz and wheel relations of, com. report, ed. * Nov 2; balanced, Dec 7-**88** * Apr 12-**89**; standard, ed. May 30; * June 27-**90**. See also under RAILS
BERLIN R., new rails *E News* * July 26-**90**
BOSTON & Albany *E News* * Apr 4-**91**
CHICAGO, Bur. & Q. 56-lb. *E News* * Aug 23-**90**
CHICAGO, Mil. & St. P. *E News* * Mar 30, 30-**89**
CHICAGO & No. W. and expt. wheel tread, C., M. & St. P. *E News* * Mar 30, 30-**89**
FALL Brook Coal Co. *E News* * Mar 5-**92**
FRANCE, Northern R. *R Gaz* * Feb 22-**89**
GOLIATH and steel base plate, Sandberg's *E News* * Nov 9 -**89**
GREAT Northern, U. S. *E News* * Feb 13-**92**
KENTUCKY Union R. *E News* * Mar 16-**89**
NEW York Cen. 100-lb. *E News* * Mar 19; standard * Apr 2 -**92**
NEW York, L. Erie & West. *E News* * Feb 1-**90**
QUEBEC Cen. 60-lb. standard *E News* * Mar 19-**92**
SANDBERG'S permanent way *Eng* July 26 *E News* * Nov 9 -**89**
SAVANNAH, Fla. & W. 70-lb. *R Gaz* * May 17-**89**
SOUTH Australia Gov't. standard *E News* * Oct 31-**91**
UNION Pacific *R Gaz* * Feb 1-**89**
VIGNOLES, the first *E News* * Nov -**89**
Rainfall, and discharge of sewers, Kinchling, insets (very full) *Am C E* * v 20, max. rates of, Fitz Gerald, insets * v 21 -**89**; cause of rain and structure of atmos., Velschow * v 23 -**90**; flow of streams and storage, Fitz Gerald, discuss., map (full) * v 27 -**92**; facts about rain making, Curtis *E Mag* July -**92**
E News in western arid regions, Greely report, Mar 16, 23-**89**; max. rates * July 21; flow of streams and storage, diags. * Oct 20; obs., Phila. *E Rec* Nov 5-**92**; artif. rain making, Houston *F Inst* Oct *Sc Am Sup* Oct 17-**91**; mean or av. and fluctuations, Binnie, discuss. (full) *Inst C E* * v 109 -**92**; rain formation, Blanford *Sc Am Sup* May 11, 18; and storms, Hazen, June 15-**89**; universal suction, Durozoi * Nov 7-**91** *Genie Civil;* of the Globe, Tripp *The Eng* Mar 18-**92**

Rain gauges, self-registering, Hering *E Rec* * Jan 3 * Mar 14-**91**

Ramie plant, source of textile fibre *E News* Oct 5; Juvenet *F Inst* Nov *Sc Am Sup* Nov 23; fibre cleaning machinery * May 25-**89**

Rams and hammers, Jameson *R & Eng* Oct -**89**. See also HYDR. rams; STEAM hammers

Rapid transit, Rap. Tran. Commiss. report to Mass. Legislature, Apr 5, '92, abs. *St R J* May -**92**; elec. interurban commun., Zipernowsky *El Rev Lond* Sep 18, 25, Oct 2-**91**; and elec. work on N. Y. eleva. R., Daft (full) *El Wld* July 6 *El Rev* * 6-**89**; N. Y., Sprague, Mar 7, Lond., Sterne, discuss. * 21; system, Sprague, June 6-**91**, N. Y., solution do. (full) *El Wld* sup. Feb 21, Mar 7, (full) May 30-**91**; in great cities, Day, Jan 2-**92**; prob., Gribble (full) *E Mag* * May * June; in N. Y. July -**91**; lessons in, Heilprin, July -**92**; N. Y. city *E & Min* * Mar 23-**89**, Rap. Tran. Com. report * Oct 24-**91**

E News N. Y. and Boston, eds. Jan 28; N. Y., Mayor Hewitt's plan, ed. Feb 18; in cities, Haupt, Apr 21-**88**; prob., cor- * July 27; Commiss. probs. Aug 10-**89**; facils., ed. Jan 4-**90**; Boston, proposed system, Mar 14; Paris, the Ladame plan, map * Aug 29; N. Y. Commiss. report, diag., plans, inset, eds. (full) * Oct 10, 17, 24, 24, pass. traffic, past and future of, ed. 31; European practice, Howes, Dec 5 *E Rec* Nov 21, 28, Dec 12, 19 *St R J* * Dec -**91**

E News Reno system * Apr 2; underground, plans, Broadway franchise sale, specs., inset, ed. * Nov 24, 24, inset * Dec 1-**92**; N. Y. prob., Steinway Commiss. report *E Rec* Oct 10, munic. ownership argus., Prout, Nov 21, Croes, 28-**91**; in cities, Haupt *F Inst* * Jan -**88**; Wright *Pop Sci* Apr -**92**; N. Y. *R & Eng* Nov -**91**

R Gaz N. Y., T. Cooper, Mar 20, Gribble, Apr 3, W. H. White * 24; reports, ed. (full) Oct 9 * 16, 23, 23, Nov 20-**91**; speed, Cowper, July 29-**92**; Thompson's gravity system *Sci Am* Sep 8-**88**; Chic., Stoltenberg *Sc Am Sup* * May 25-**89**; in cities, T. C. Clarke *Scribner's* * June -**92**; Haupt *St R J* Feb -**88**; Sprague, sup. * Mar, June, question, Gribble * Mar, May, Crosby * Apr; Lond., Reckenzaun, May, Aug * Dec -**91**. See also names of places; R's, elec. — elevated — underground, etc.

Ravine du Sud, Is. of Hayti, Crowell, discuss., insets *Am C E* * v 24 -**91**

Rawlinson, Robert *The Eng* Jan 6-**88**
Raymond, Robert R., por (full) *E & Min* * Dec 29-**88**
Real estate, Internat. Co. of Mex. & Lower Cal., n *E News* Mar 31-**88.** See also LAND
Reed, Edward M. *Am C E* v 26 -**92** *Am M E* v 13 -**92**
Reed, Samuel B. *Am C E* v 27 -**92**
Refractory materials, Egleston *Sc Am Sup* Sep 27, Oct 4-**90.** See also BRICK, fire-brick
Refrigerating, aut. system, Denver, Col., Hanks, insets *Am C E* * v 24 -**91**; 35-ton machine, ammonia-absorption type, performance, Denton *Am M E* * v 10-**89,** 75-ton do. * v 12 -**91** *E & Min* * May 16, 23-**91**; plant test, De V. Wood *Am M E* * v 11 -**90** *E News* * June 28-**90**; results of performance of, Denton-Jacobus, July 7 *Am M E* * v 13 -**92**
Cassier's mechan. refrigeration, Penney, * Dec -**91**; La Vergne Co. * Apr -**92**; Bate Co. decis. *El Wld* Feb 2-**89**; de la Vergne system, inset *Eng* * June 15, 22-**88**; ammonia compression system * Feb 8-**89**; machines, Richard, bk. review, Jan 9; tests * July 31 * Aug 28; and ice-making plant, Newcastle-on-Tyne * Dec 4-**91**
E News Miller's ap. * Jan 9; use of oil in ammonia gas compressors and effic., Strombeck, insets *F Inst* * Apr -**92**; use of ammonia as refrig. agent, Lightfoot *Sc Am Sup* May 26 *The Eng* Oct 26-**88**; machines, Peabody *Tech Q* * May -**89**; machine, Birkenhead *The Eng* Oct 5-**88**; Arktos cold air and freezing ap. * Mar 8; Pontifex's machine, Sep 27-**89**; Linde system plant, 150-ton, Shadwell works, inset * May 16, 30-**90.** See also ICE machines
Refuse, disposal, house *Eng* May 15-**91**; Watson (full) Sep 16 * 30, and ed. *E News* Oct 6, N. Y. city report, 27 * Dec 1; cremators *E Rec* * Oct 8-22, Nov 19-**92.** See also CREMATORIES; MUNIC. eng.
Reid, David *Inst C E* v 110 -**92**
Rendering tanks construct. *Locom* Feb -**89**
Rennie, William C. *Inst C E* v 105 -**91**
Reproduction, probs. of, Hartog *Contemp Rev* July -**92**
Reservoirs, storage, appropriation, ed. *E News* Oct 6-**88**; waste weir capac. det., McAlpine, June 29-**89**; U. S. and Can., embankments and dams, inset * June 21-**90**; covered, Swan *R & Eng* Oct *J N E Water W Assoc, E Rec* Oct 13, 20 -**88**

Reservoirs

E Rec distrib., Curtis, June 20; water storage, Stearns, Oct 17; det. of capac., Fitz Gerald, 24; storage, Mass. State Bd. of Health report, Nov 14-**91**; use of asphaltum for linings, Schuyler, Dec 17-**92** *Am C E;* res. dams, safety and service of, Kresnik, abs. *Inst C E* v 99 -**90** * *Woch Ost Ing* -**89**. See also DAMS; WATER-works, under names of places

BOSTON, Mass., Waban Hill *E Rec* * Aug 24, 31-**89**

BUFFALO, N. Y., Prospect, new *E News* * Jan 10-**91**

COSHOCTON, O. 320,000 gal. covered *E Rec* * Aug 15-**91**

EALING, Grand Junct. Co. storage *The Eng* Aug 24, 24-**88**

EGYPT, the Raiyan impounding, Nile flood, Whitehouse *Eng* * Sep 14-**88**, Sep 19-**90**; storage in, ed. Oct 16-**91**

HALLINGTON, West, Henzell, inset *Inst C E* * v 102 -**90**

HUDSON, Wis. covered *E News* * Mar 15-**90**

MANCHESTER works, inset *Eng* Feb 5-**92**

NASHVILLE, Tenn., Parsons *E News* * June 16-**88**

NEBRASKA City, Neb., failure of *E News* * Apr 19-**90**

NEWTON, Mass. covered *E Rec* * Apr 18-**91**

NEW York, reservoir 'M,' inset *E News* * Mar 22-**90**

PARIS, France, Montmartre 3-story covered *E Rec* * Aug 9, abs. *Inst C E* v 100 -**90** *Sc Am Sup* * Mar 8 *The Eng* * Jan 17-**90**; Bechmann, abs. *Inst C E* v 105 -**91** *An Ponts* Feb -**91**

PHILA., Conshohocken hill remark. breaks, Lukins *E News* Aug 18-**88**

TORCY, France *R & Eng* * Jan -**90**

TORONTO, Ont., Can., Rose hill embank. *E News* * Aug 2-**90**

WHEELING, Va. *E News* * Mar 12-**92**

Resins, waxes and solid paraffins, Church (full) *Sc Am Sup* * Apr 9-**92**

Retaining walls, for earthwork, Greene *E News* * Dec 29-**88**; design of, K. Allen *E Rec* * Nov 12, 19; old revetment wall, Montreal har., Sproule *R & Eng* * Dec *R Gaz* * Nov 18-**92**; M'Elroy, Nov 9-**88**. See also DAMS; HARBOR eng; R's, embank; RESERVOIRS

Retort, mechan., with continuous feed and discharge, Haig *E & Min* * Jan 31-**91** *J Soc Chem Ind.* See also GAS retorts

Reynolds, Edwin, por. *Cassier's* * Mar -**92**

Rhind, James *Inst C E* v 99 -**90**

Rice, culture in cen. China, Franklin *Sc Am Sup* June 8-**89**; hist., Proctor, Oct 10-**91**, manuf., do. July 9-**92**

Richards, Thomas M., por. *E & Min* * Nov 29-**90**
Richardson, Robert *Inst C E* v 107 -**92**
Richardson, William A. *Locom* Apr -**89**
Richmond, Va., eng. prob. at (canal, etc.) Adams *Am M E* * v 12 -**91** *Eng* Jan 9-**91**
Riddell, Robert (full) *Inst C E* v 106 -**91**
Rigden, John L. *Inst C E* v 109 -**92**
Ring, Robert *Inst C E* v 100 -**90**
Rings, thin elastic, flexure of, De V. Wood *Am M E* * v 12-**91**
Riotte, Eugene N., por. *E & Min* * May 16-**91**
River-gauging at Vyrnwy reservoir, Parker, inset *Inst C E* * v 92 -**88**
River motor, fluviatile *Sc Am Sup* * July 28-**88**
River profile of bottom register ap., Stecher *E News* * July 25, n *R & Eng* * Oct -**91**
Rivers, improvement, Atlan. coast, Craighill, *E Rec* * Aug 11-25, discuss., insets *Am C E* * v 19 -**88,** sedimentary discuss., Striedlinger, Worthen, Henshaw, insets * v 20 -**89**; mean horse power of, cals. variable stream and cost of replacing power lost by partial diversion of the flow, Grant, discuss. v 22 -**90**; self-purification of streams, Rafter, insets * v 24 -**91**

Am M E river practice of the west (boats), Sweeney * v 9 **88**; stream measurements, U. S. Geol. survey results, Newell (full) *Am Min* * v 20 -**92**; signalling across, in India, Melhuish *El Rev Lond* Apr 18-**90**; future world's highway, Gribble *E Mag* * Apr – June; flood effects in western, Going, Sep -**92**; mining in Cal., Boynton *E & Min* * Sep 5-**91**

E News pollution of streams, Hering, Aug 4-**88**; comput. of discharges, G. Johnson, Sep 6-**90**; river pollution in U. S., C. Brown, Mar 21, 28, abs. *Inst C E* v 103 -**91** *J Assoc E Socs;* self-purification of, Frankland *E News* Sep 5-**91**; discharge obs. of large streams, Davison *E Rec* May 7; months' imp., Corthell report, Aug 27, Sep 3-**92**; jetties for imp. estuaries, Haupt *F Inst* Apr -**88**

Inst C E simple method of ascertaining discharge, Harlacher, Richter, abs. * v 91 -**88**; bars at mouths of tidal estuaries, Wheeler *The Eng* Feb 7, discuss., inset (very full) *Inst C E* * v 100 -**90**; self-purification, Stearns, abs. v 105 -**91**, Meyer, abs. v 109 -**92** *Mass State Bd. of Health;* crossings and bridge piers, Otagawa *R & Eng* * Nov * Dec -**88**; nav. river material, expt. researches ap. *Sc Am Sup* * Sep 24-**92**

Rivers

The Eng river flushing, Milwaukee, Dec 28-**88**; imp., applic. of transporting power of water to deepening, Wheeler, Oct 25, Nov 8-**89**, July 18-**90**; and navigable canals, England, Dec 25-**91**; tidal, buoying and lighting, Wheeler * Apr 8, 29-**92**. See also CANALS, rivers in France, Belgium and Germany

AIRE & Calder nav. and canal waterway, Bartholomew *E News* * Aug 30-**90**

AVON imp. below Bristol, Chatham, insets *Inst C E* * v 98 -**89**

BAVARIA, imp. *E News* * Mar 17-**88**

BILBAO imp. *E News* * Aug 31-**89**, Churruca report, abs. *Inst C E* v 76, 98, 104, insets, 107 -**92**

BRAZOS, Tex., imp., jetties *E News* * May 18, June 22-**89**

BRENTA imp., Cesareni, abs. *Inst C E* v 99 -**90**

CLYDE, Millar, Blackie, Lond. '88, bk; export trade '88 *Eng* Jan 4; Macalister, abs. *Inst C E* v 95 -**89**

COLORADO cañons, availabil. for R. purposes, Stanton, discuss., insets (full) *Am C E* * v 26 -**92**

COLUMBIA, jetty *E News* * Apr 18-**91**

COSEL, imp. at, Oder river (Europe) *E News* * May 3-**90**

DANUBE imp. *E News* July 11-**91** * Apr 2-**92**; the Sulina mouth of, Kuhl, Hartley append., insets, *Inst C E* * v 91 -**88**, inset * v 106 -**91**

DELAWARE, obstructions in *Sci Am* Mar 16-**89**

ELBE, ht. prediction of, in Bohemia and Saxony, Harlacher, Richter, abs. *Inst C E* v 91; regulation between Melink and Koniggratz, Oelwein, abs. v 92 -**88**; Sax., flow measurements, 1886-7, Ringel, abs. v 95 -**89**

JAMES, imp. at Richmond, Va., W. Adams *E News* Nov 22 -**90**

LOIRE, imps., Paris exhib., map *Eng* * July 19, 26-**89**

MAIN, canalization between Frankfort and Mainz, abs. *Inst C E* v 92 -**88** *Deut Baus* -**87**

MISSISSIPPI imp., flood hts. in reach between Helena and Vicksburg, Starling, insets *Am C E* * v 20 -**89**, keeping within banks, do. *E Mag* * Apr -**91**; impending disaster on, June, prob., Dutton, Aug, Starling * Nov -**92**

E News connecting with upper lakes, Handburg, Feb 18-**88**; Gov't. protective works, mat, Memphis * Oct 26; levee con-

Rivers, MISSISSIPPI
struct. Nov 9; bank protection * Oct 26, Dec 14-**89**; flood of 1890, Harrod, Apr 5; Lower, protection from overflow, J. B. Johnson, 19-**90**; Sabine Pass imp., Turtle cor., Haupt *F Inst* Aug -**88**; hist., Redway (full) *Sc Am Sup* July 11, 18-**91**
ODER, imp. at Cosel (Europe) *E News* * May 3-**90**
PORTLAND, W. T., imp., Freeman, inset *E Mag* * Aug -**92**
POTOMAC basin, hydrography of, Babb, discuss., inset *Am C E* * v 27 -**92**
RHINE reg. works, between Eltville and Oestrich, Imroth, abs. *Inst C E* v 92 -**88**; reg. at St. Gall, Wey, abs. v 103 -**91**
RHONE, imp. of months of, Guerard, report abs. *Inst C E* * v 101 -**90**. See also POWER, Rhone river at Geneva
SEINE, lower, Suresnes locks and weir, Luneau, abs. *Inst C E* v 101 -**90** *An Ponts* * v 18 -**89**; canalization of, abs. *Sc Am Sup* * Mar 16-**89** *Genie Civil*
STEEPING and Wainfleet Haven imp. *The Eng* * May 13-**92**
SUSQUEHANNA floods, Raymond report *E Rec* Jan 23-**92**
WEAVER nav., Sauer *E News* Aug 30-**90**; Stoney's sluices, Manchester ship canal *The Eng* * Jan 9-**91**
WITHAM channel and outfall imp. works, Williams, discuss., inset *Inst C E* * v 95 -**89** *The Eng* Dec 7-**88**
YELLOW *E News* Mar 31-**88**
Rivet signs, uniform system of *E News* Jan 25, cor. Feb 9, symbols, cor. * Mar 2, Seaman, cor. * Apr 13-**89**; diag. * Sep 15 -**92**
Riveted joints, on an angle, expts., Flint *Am C E* * Oct 27-**92**; copper, strength *Eng* * Apr 24; * Dec 4-**91**; riveting tests, Buckholz * Dec 6-**90**; diags. * Feb 6-**92**; net section in, Cooper *R Gaz* * Aug 22; plates, tests * Oct 10-**90**; Allen (full) *Sc Am Sup* * July 18-**91**; of max. strength, Nicolson *The Eng* Oct 19, Nov 9, 30-**88**. See also BOILERS, riveted joints
Riveter, Allen pneu. *Eng* * Nov 23-**88**; Schonbach's hydr. * May; hydr., 200-ton plant * Feb 14, 14-**90**
Road engines, rollers *Cassier's* * Aug -**92**; locom., Burrell *Eng* * June 20; steam on common roads, McLaren, Nov 21 *The Eng* Nov 21 *E News* Dec 20; locom., Aveling & Porter * June 28-**90**; traction, European experience, McLaren * Apr 4; the Springfield steam roller, inset * Nov 21-**91**; Burrell compound *The Eng* * Dec 12-**90**; 8 h. p. compound * Sep 11 -**91**

Roads, betterment of our highways, Shaler *Atlan M* Oct; and road rollers *Cassier's* * Aug; our common roads, Potter *Century* * Apr -**92**; highways and nat. prosperity, North *E Mag* * Apr; good wagon roads, importance, Haupt, June; Europe and Am., Potter * Aug; wagon, future, Claypoole, Oct -**91**; convict labor in road making, Roberts, July -**92**; *E & Min* Apr 16, Mundin, Baker, 23-**92**; and pavements, Love, bk. n July 12-**90** *E Rec*

E News valuation of road metal and setts for paving, Stock, Sep 22 *The Eng* Aug 31-**88**; country, in France, construct. and maintenance laws *E News* Feb 6, 23, Mar 2; country, legislation in Pa. Apr 6; construct. and repair of, London, Strachan, 13; good, value of, May 18; common, N. Jersey law, July 27; Am. legislation, bk. n Dec 7-**89**

E News country, notes, Downing, Feb 8; foreign highway construct. and maintenance, 22, Mar 1, 15, 29; maintenance, Roads Imp. Assoc., Lond. * Aug 16; repair and maintenance of, England, Sep 13; road work in Richmond Cty., N. Y. Dec 13-**90**; country, money value of good, report, Feb 7-**91**

E Rec road making, Herschel (prize treatise) Mar 9, Apr 20, 27, May 4, 11; Greene, Aug 10 *Harper's W* Aug 10, 17; good, Pope *E Rec* 31, Shaler, abs. Nov 9 *Scribner's;* Bridgeport macadam, North *E Rec* Dec 28-**89**

E Rec resist. to traction, Hering, Jan 25; Penn. highways report, Feb 15; construct. and maintenance, Thompson (prize article) Mar 29, Apr 5-19, Pritchard, 19, 26, May 3, com. comments, 10; main, maintenance, Hooley, Aug 10; machinery, cost of, Oct 4-**90**; European sts. and highways, Dec 12; Brookline, Mass. macadam, contract, 19-**91**

E Rec county, construct. and repair, Owen, Jan 30 *Sc Am Sup* Mar 12 *E News* Feb 13; road across a marsh, Waite cor. *E Rec* Feb 20; highway roller repairs, French system, Durand-Claye, Mar 5, Bacot, cor. 19; road making in eastern Mass., McClintock, 26; administration of French highways, Neff, Apr 16; Telford road making, Lenox, Mass. * 30; instruction in highway eng., C. Allen, June 11, July 2, 23, (full) *Soc Arts Mass* -**91**; highway construct., disputed points, Owen, Nov 19 -**92** *Am C E*

Inst C E roadways construct. across peat bogs, Schacht, abs. v 104 -**91**; highway, location, ed. *R & Eng* * May -**90**; sections, Prov., R. I. * July; Janvier *Sc Am Sup* Feb 27; legal

Roads
responsibility for defective highways, Bly *St R J* Mar -**89**; Brighton foreshore imp. *The Eng* July 12-**89**. See also MUNIC. eng; PAVEMENTS; STREETS

Road vehicles, draught and haulage of *Sc Am Sup* * Dec 5 *The Eng* * Oct 16, cor. Dec 4 * 11, 25-**91**

Roanoke, Va., survey of *E News* * Jan 9 * June 23-**92**

Roberts, Peter *Inst C E* v 96 -**89**

Robertson, Henry *Inst C E* v 93 -**88**

Robertson, James (full) *Inst C E* v 99 -**90**

Robinson, Moncure (full) *Am C E* v 26 -**92**, n *R Gaz* Nov 13-**91**

Robinson, S. S., por. *E & Min* * Apr 11-**91**

Rock, drilliing machine, hydr. *Eng* * Feb 17-**88**; Dubois' boring machine, Paris exhib. July 12-**89**; M'Culloch's drill, Rio Tinto * Sep 12-**90**; drills, Carbutt & Davey, Mar 27; and ore breaker, Gates I. Co., Chic. * June 19-**91**; and ore crusher, Brennan *E News* * Oct 18-**90**; removal under water without explosives, Lobnitz, inset *Inst C E* * v 97 -**89**. See also DISINTEGRATOR; DRILLS; MILLS; QUARRIES; STONE and names of rocks

Roe, John P. *Inst C E* v 98 -**89**

Roehricht, Richard H. O. *Inst C E* v 106 -**91**

Rogers, William *Inst C E* v 95 -**89**

Rolling mill engines, reversing, Krupp works, Essen, Ger., inset *Eng* * Sep 5-**90**; details * Dec 4-**91**; 10,000 h. p., Jarrow *The Eng* * Aug 9-**89**

Rolling mills, Simond's universal *Eng* * May 25 *Sc Am Sup* * May 5-**88** *Iron Age*; 15 in. 3- high blooming, Lack. I. & C. Co., Scranton, Pa., inset *Eng* * Jan 23; rolling fluid metal, H. Bessemer * Oct 9-**91**; failures of chilled iron rolls, Winder * Oct 21-**92** *E & Min* construct. of passes in rolls for reducing metals, Hewitt, Aug 25 * Sep 1-**88**; Am., evolution of, R. Hunt *E News* Nov 28, 28, (full) *R Gaz* Nov 20-**91** *Am M E*; universal, for girders and cruciform sections, Sack *Sc Am Sup* * Jan 7-**88** *The Eng* * May 10, 17-**89**. See also STEEL, German works

Rome, excavs. in ancient, Lubbock *Sc Am Sup* Mar 22-**90**; devel. of capital at, Hemphill, Oct 1-**92**

Roofing, slates, strength and weathering qualities, Merriman, discuss., insets *Am C E* * v 27 -**92** *E & Min* Sep 24-**92**; paper for material *E News* Sep 21-**89**; roll tar paper manuf. (full) *Sc Am Sup* Sep 26-**91**; tiles glazing, terra cotta, etc. July 9-**92**

Roofs, det. of stresses in elastic systems by method of least work, Cain, inset (full) *Am C E* * v 24 -**91**; Cathcart st. station, Greenock R., inset *Eng* * Mar 22-**89**; Fairfield works boiler shop, Govan * Oct 3-**90**; July-Sep -**92**

E News 22d reg't. armory drill room, N. Y. * Apr 13-**89**; truss failure, Troy, Ala., cor. * May 9-**91**; trusses, coeffs. for figuring strains in, table * Aug 11; 4-mile crib, Chic. * Sep 15 -**92**

E Rec 12th reg't. armory, N. Y., inset * Jan 7; truss, So. Brooklyn R. car shed * Mar 17; a cantilever * Aug 4; St. Paul church * Oct 27; rink truss * Nov 17-**88**; So. armory drill-hall * Apr 20; armory, Cin., O. * Dec 7-**89**

E Rec iron mill * Jan 25 * Feb 1-**90**; arcade, Cleveland * Mar 21, 28 * Apr 4; erection traveler, Newport News Ship Bld. Co. * Apr 25; Charleroi plate glass works * May 9; iron shop * Aug 29; strains in trusses *Locom* * May -**91**

R Gas Westinghouse machine shop * June 6; rational trusses Arajol, June 27, cor. *The Eng* * Oct 24-**90**; roof water removal, Porter *Sc Am Sup* * May 18-**89**; iron *St R J* * Aug -**90**; iron, So. Mahratta R. *The Eng* Oct 19-**88**; barracks at Aden, Aug 30, Sep 6-**89**; a rational truss, Graham * May 16-**90**. See also BUILDINGS; EXHIBS., U. S. Columbian – U. S. Gov't. bld; FACTORIES; MILLS; Rs, stations, etc.

AGRIC. bld., Chic. exhib. *Eng* * Apr 29 * May 6-**92**

ALLEGHENY County court-house *E Rec* * Nov 10-**88**

CARLISLE Corp. markets *The Eng* Mar 30, Apr 13, 13-**88**

CHICAGO Auditorium trusses *E Rec* * Nov 22, 29-**90**

DULUTH Union depot *E Rec* * Feb 6 * Mar 12, 19, 26 * Apr 9, 23, 30 * May 21-**92**

DUNDEE R. station, Caled. R., inset *Eng* * June 28-**89**

EDINBURGH exhib, inset *Eng* * Apr 11-**90**

FOUNDRY plant, the Worthington, Elizabethport, N. J. *E Rec* * Apr 2-**92**

HORTICULTURAL bld., Columb. exhib. *Eng* * Nov 11, 18, 25-**92**

MACHINERY Hall, Columb. exhib. *E Rec* * Dec 24, 31-**92**

MADISON Sq. Garden bld. *E Rec* * Jan 17-31-**91**

MANUF'S bld., Columb. exhib., insets *E News* * July 28 * Sep 1, 8-**92**

OLYMPIA, Nat. Agric. Hall, erection, Read *Eng* * Dec 28-**88**

PARIS exhib., Machin. hall, inset *Eng* * June 1-**88**; blds. * May 3-**89**

Roofs, PENN. R., Jersey C. terminal station *Eng** Apr 1-**92,** train shed, inset *R Gaz* * Oct 2-**91**
TRANSPORT. bld., Columb. exhib. *Eng* * Dec 2, 9, inset *E News* * 29-**92**
U. S. Columb. exhib. blds. *Eng* * Oct 30, inset * Nov 13-**91** *E Rec* * Aug; Gov't. bld. *Eng* * June 10-**92**
Rope driving power transmiss., and cable, best speed of, Cooper, discuss. *Am M E* v 9 -**88**; two haulage systems, Norris *E Rec* * June 27 * July 18 *Am M E* * v 12; C. Hunt * v 12 -**91** *E News* * Nov 15-**90** *E & Min* * Jan 31-**91** *E Rec* Nov 15 *Pwr* * Dec -**90,** Jan -**91**; Grimshaw *Cassier's* * July, influence of longitude on, do. Oct; ed. *El Rev Lond* Sep 16-**92**; underground haulage, J. B. Smith *Eng* * Feb 17 * Mar 2, 23; Otto system haulage * Apr 6-**88**; Miller, diag. *E News* * Dec 6 *The Eng* Dec 19-**90**
Pwr Seymour * May-July * Nov -**89** * June * Sep -**90**; at Willamette mills, Portland, Or. * Jan -**92**; *Sc Am Sup* * Mar 24-**88**; by manila ropes, Gregg * May 24-**90** *J Assoc E Socs; Sc Am Sup* May 24-**90**; * Mar 24-**88**; *St R J* * Apr * Sep -**90.** See also POWER transmission; TELPHERAGE
Ropes, manila and hemp, strength and power transmiss., Miller, diag. *E News* * Dec 6; *The Eng* Dec 19; and hitches *E Rec* * July 19-**90**; strength of, Duboul, abs. *Inst C E* v 92 -**88,** do. expts., French *R Gaz* June 29-**88.** See also CABLES; WIRE ropes
Ropes Pass, Texas, Kent *E Mag* * June -**92**
Ross, George H. *Inst C E* v 95 -**89**
Rotary boilers connections *Locom* * Aug -**90**
Rotary engines, ancient and mod., Jamieson *Cassier's* * Feb -**92**; Brown's *El Rev Lond* * July 10-**91**; duplex *El Rev* * Nov 29, n *El Wld* * Apr 12-**90**; the Rota *Eng* * July 20; Lidback's vibrating *F Inst* Oct *R & Eng* * Nov; Bullock *Pwr* * Apr; Rigg's *Sc Am Sup* * Mar 10-**88**; revolving cyl. * Nov 8; *The Eng* * Mar 7, valve gear * Apr 25-**90,** * Jan 23; hydr. winding with variable stroke * Oct 16-**91**
Rotary-piston valve, engine governing by, Aldrich *Am M E* v 13 -**92**
Rotary pumps, Johnson's *The Eng* * July 3, boiler feeder * Dec 25-**91.** See also PUMPS, rotary
Rouen port, France *Eng* * Oct 11-**89**
Routing machine, Parry's *Sci Am* Mar 23-**89**

Routledge, Thomas *Inst C E* v 92 -**88**
Rowland, Henry A., por. *El Wld* * Mar 9-**89**
Royal Institution Soc., Lond. pro. *El Rev Lond* May * June 12-26-**91**; *Eng* May 16, 23-**90**, May 22, 29, June 5-26, July 3, 10, Dec 18, 25-**91**, Jan 8-22, Feb 12, Mar 4, 11, 25, June 17, July 22, Aug 12, 19, Dec 9, 30-**92**; pors. members *Sc Am Sup* * Sep 7-**89**; June 14-**90**
Rubber, india, properties, in Russian navy, Vladimiroff, abs. *Inst C E* v 109 -**92**; *Sci Am* Apr 6-**89**; vulcanization of, Gerner *Sc Am Sup* Jan 4; * July 12, Sep 6; indus., hist. (Hayward's expts.) Oct 18; vulcanization and decay of, notes, W. Thomson, Dec 6-**90**; supplies sources, Sherman, Feb 6; gathering in Amazon valley, Kerbey, Mar 19-**92**. See also GUTTA-percha
Rundle, Cubitt S. *Inst C E* v 100 -**90**
Russ, William *Inst C E* v 104 -**91**
Russia, commerce and mineral industries, ed. *Eng* Dec 25-**91**; diagonally through, ed. cor. *E News* Oct 11, 18-**90**
Russian sheet iron *Sci Am* Feb 2-**89**
Ryan, Jeremiah *Inst C E* v 107 -**92**

Sabine Pass imp., cor., Turtle, Haupt *F Inst* May -**88**
Sacre Charles R. *Inst C E* v 98 -**89**
Safety lamps, the Thorneburry *Eng** Nov 15-**89**; miner's, notes, Hughes *E & Min* * Mar 28-**91**
Safety valves, lever (full) *Locom* * July -**92**
Sahara, the, James *Locom* Aug -**89** *Sc Am Sup*
Sails, action of, Vogt, cor. *Eng* * Oct 11 *Sc Am Sup* * Dec 21 -**89**
St. Louis, Mo., pavements, Macklind *E News* Mar 14; topog. survey of, Connet, Oct 31-**91**; pub. works management, Jan 23; new growth of, Ralph *Harper's M* * Nov -**92**. See also PAVEMENTS; SEWERS; STREETS; WATER-works, etc.
Salida, Col., inset *E & Min* * Dec 21-**89**
Salmond, John M. *Inst C E* v 102 -**90**
Salt, works, obtaining brine, Brush, Tully Pipe Line Co., N. Y., discuss., insets *Am C E* * v 23 -**90** *E News* July 5-**90**; the Petite Anse mine, La., Pomeroy *Am Min* * Apr 17-**89**, Bolton *Sc Am Sup* July 28, Pomeroy * Nov 10 *E & Min* * Oct 6-**88**; manuf., Pick's system in vacuo * July 12-**90**; wells, Onondaga, '90, Engelhardt, Feb 21-**91**; U. S. produc., do. Jan 2; manuf., China * Feb 6-**92**

Salt works

Sc Am Sup from sea-water, Merrill, Apr 20; manuf. n Sep 7 -**89**; works, Cheshire, Apr 19; manuf. in vacuo, Nursey * July 26; mines, Retsof, Greigsville, N. Y., Sheldon, Dec 20-**90**; N. Y. indus. * Nov 14-**91**; *Iron*

Salter, Frank *Inst C E* v 96 -**89**

Samoa *Century* May -**89**

Sand pumping, dredging and Mersey bar, ed. *Eng* Apr 11-**90**

Sandstone indus., U. S., Day, Cens. bull. abs. *E & Min* July 4 *E News* 18-**91**

Sanitary engineering, Manchester, England, ed. *Eng* Sep 30; bad air in theatres, Montgomery *E Mag* May -**92**; san. sci. in the home, Richards *F Inst* Aug; safety in house drainage, Hoyt *Pop Sci* July; Bayles *Sc Am Sup* Dec 15-**88**; legislation, England, results, Calkins, inset *Tech Q* * Dec -**91**. See also BUILDINGS; Health; MUNIC. eng; PLUMBING; REFUSE disposal; SEWERAGE

Santoy, John B. Austis du *Inst C E* v 96 -**89**

Saw machine, double band, for deep cutting *The Eng* * Mar 8-**89**. See also BAND saws

Scales, comparison of binary and decimal, table *Locom* Dec -**88**

Scarborough. See HARBOR eng., Scarborough

Scarlet fever, etiology of, Klein *Sc Am Sup* Jan 21, Mar 17-**88**

Schaufuss, Erich C., Bowden *Am Min* v 17 -**89**

Schiseophone (flaws in metals) ap. *Sc Am Sup* * July 5-**90**

Schliemann, Heinrich, por. (full) *Sc Am Sup* * Feb 28, Manatt, 28-**91**

Schmidt, Bernhard *Inst C E* v 96 -**89**

Schneider, Henry W. *Inst C E* v 92 -**88**

Schools, engineering, plea for the printing press in, Hawkins *Am M E* v 9 -**88**; technical, of Am., Purdue Univ., La Fayette, Ind., Goss, pors. *Cassier's* * Aug -**92**; Lond. Tech. Inst., Tunzelmann *Eng* * Nov 2, inset 16-30 * Dec 7, 21-**88**; Steven's Inst., Hoboken, N. J. * June 7-**89**; Cornell Univ. & Sibley Coll. Aug 22; Finsbury tech. coll. Nov 21-**90**; Brown Univ., Prov., R. I. * Sep 11-**91**; manual training *E & Min* Feb 1 -**90**

E News premiums for graduating theses, Jan 30; Mass. Inst. of Tech. July 14, 21; Cornell Univ. 28; Lawrence Sci. reorganization, Sep 22-**92**; education, value and drawing and hand-

Schools
work in pub., Combes *F Inst* Sep -**89**; nat. hist. in elementary, Hensoldt, Jan; and trade schools, J. Wilson, Feb - Oct -**90**; eng. Brit. dominions, bk. *Inst C E* -**91**

Tech Q Mass. Inst. of Tech., beginning, Munroe, May -**88**; sci. and tech., place of in Am. education, Walker, Dec -**91**; English composition in colleges, Carpenter, Oct -**92**. See also EDUCATION; ENGINEERING schools

Schopenhauer, Arthur, por. *Sc Am Sup* * Apr 21-**88**

Schwarz, T. E., por. *E & Min* * Aug 29-**91**

Science, Smithsonian Inst. reports, bk., Gov't Printing Office, Wash; is science disciplined knowledge, Varley *El Rev Lond* Jan 2, 9-**91**; prog. in '89 *E News* Jan 4-**90**

F Inst limits of scientific inquiry, Hensoldt, May; applied, possibilities of, O. Smith, June -**91**; notes, see *F Inst* files; recent Kropotkin *19th Cent* May, Aug, astron., Mars, biology, human muscle, Dec -**92**; circle of the sciences, Coleman *ut* Oct -**88**; scientific socs. of Italy, Cahall *Pop Sci* Nov -**92**

Sc Am Sup hist. of a scientific doctrine, Langley *Sc Am Sup* Oct 27, Nov 3-**88**; the man of sci., Thurston (full) Jan 2; natural relation to art, Du Bois-Reymond, Feb 20-**92**; beginnings of, Calkins *Tech Q* Apr -**91**; measuring earthquakes, ozone ap., Roy. Inst. pro. *The Eng* June 29-**88**

Scott, Michael (full) *Inst C E* v 104 -**91**

Scott, William B. *Inst C E* v 109 -**92**

Scranton, William H., Raymond *Am Min* v 18 -**90**, por. *E & Min* * Oct 12-**89**

Screen, gyrating, Coxe & Salmon *Eng* * Aug 30-**89**

Screw bolt, expts. with, McBride *Am M E* * v 12 -**91**

Screw propellers (marine), effective area of screws, Jacobus *E News* Aug 3 *Am M E* * v 11 -**90**; effic. as dependent on surface form of propeller, Durand * v 13 -**92**; planing machine, Sunderland *Eng* * Jan 27; expts., Andreœ * Apr 13; blades material, Parsons cor. 20; Dickinson's * 27 *Sc Am Sup* * May 26-**88**

Eng life of, cor. * Jan 25; model expts., formulas, Vogt cor. * Nov 29-**89**; Howden, Apr 18, theory cor. May 2; Barnaby, May 16, discuss. inset (full) *Inst C E* * v 102 -**90**; screw propul. and non-reversible engines, McGlasson cor. *Eng* * Dec 18 -**91**; Barnaby, bk. review, Feb 26; effic., Froude * May 6, dimens. * 13; arrangement of surface, expts., Walker, Nov 4,

Screw propellers
effic. *Sc Am Sup* Dec 31, ed. and cor. Oct 28, Nov 4, 4-**92** *Inst M E;* physics of, Lowe *Sc Am Sup* May 2-**91**
The Eng Trew cor. Aug 24; ed. Dec 28-**88**; blades design, Fitz Gerald * Aug 22 * Sep 19; Mansel cor. Oct 31, 31-**90**; Vogt cor. * Feb 6; Fitz Gerald cor. May 8; ed. July 17; Mc Glasson's reversing * Oct 23; typical (shapes) * Dec 25-**91**; Mansel cor. Dec 23-**92**

Screw pile pier at Kotonon, in Africa, inset *E News* * Oct 6-**92**. See also PILES, screw

Screws, perfect, prob., Rogers *Am M E* * v 12-**91**; wood, rolled *Eng* * Nov 22-**89**; Lieb's ball bearing *The Eng* * Nov 28; anti-friction, Dec 12-**90**; screw threads, Gill *F Inst* * Mar -**88**, Forney *R & Eng* * Oct -**90**. See also SCREW bolt

Sea-beaches, Shaler *Scribner's* * June -**92**

Sea-sickness, mechanics of, Greenhill *The Eng* Aug 28-**91**

Sea-walls, asphalt in, Ambrose *E Rec* May 16-**91** *Am C E*. See HARBOR eng., sea-walls

Sea-water, effect of oil on disturbed water, Beynon *Sc Am Sup* Mar 1-**90**. See also OCEAN

Secret service, elec., individual telegraph call *R Gas* * Aug 28 -**91**

Seismograph, Ewings duplex pendulum (vibration measurer) *Eng* * Feb 22 *Sc Am Sup* * July 20-**89**

Sellers, Coleman, por. *Cassier's* * June -**92**

Sennett, Richard *Inst C E* v 107 -**92**

Sewell, John *Inst C E* v 92 -**88**

Sewerage and sewers, sewage disposal, C. Allen, discuss. *Am C E* v 18-**88**; and rainfall, relation between and discharge in populous districts, Kuichling, discuss., insets (very full) * v 20-**89**, abs. *Inst C E* v 97-**89**; sewage purification by electrolysis, Webster *El Rev Lond* * Oct 11 *E News* Apr 13, Berlin, Oct 26 *Sc Am Sup* * May 4 * Nov 23-**89**, Apr 25-**91** *The Eng* * Mar 29-**89**; purific. by microbes, ed. *Eng* Oct 7-**92**; disposal, England, T. K. Thomson *E Mag* Sep -**91**; disposal in U. S., Rafter * Jan -**92**
E News formula for vel. of flow in sewers, Hering, Dec 15-**88**; the Galvin flusher * Jan 19; the Hardie plant * Feb 2, formula, Hartford, 16; proportion of rainfall reaching sewers; Kuichling, Mar 16-30; discharge tables, Gloyne, Apr 6; gauging,

Sewerage and sewers
Kuichling, 13, 27, May 4; test borings by hand labor, outfit * May 11, Guthrie cor. * 25; experience in sewage, Lindley, July 6-**89**
E News Ford's ventilator * Aug 2; systems in U. S. and Can., ed. 23; trench excavator * Sep 27; frame for cleaning * Nov 1-**90**; sewage precip. tanks, upright, Baumeister * Feb 7; pipe and brick sewers cost and manholes and catch basins, Troy Imp. Commiss. report, table, Oct 24-**91**
E News systems of N. E. states, table, ed. May 19; sewage disposal of isolated dwellings, Parry, June 2; ground water conduit * 30; sewage purific. in Am. July 14; Shone system * Aug 4; flow in pipe sewers, diag. * Aug 11-**92**
E Rec sewer construct., Brooks * June 16; pipe, construct. and ventil., McClintock, June 2-**88**, June 22, July 6, 13; sewage disposal, European practice, Swan, Apr 6; systems cor. May 4; sewerage and land drainage, Waring, bk. review, Oct 26-**89**; natural purific., Mills, Dec 20-**90**
E Rec sewage disposal, Hering report, Mar 7, 14; sewer ventil., Read, Oct 17; sewerage systems cost and construct. of 35 systems, table, 24; disposal, Robinson, Nov 21, 28-**91**; treatment works, English, Jan 2; disposal at isolated houses * Apr 9; purific. by microbes, Nov 12; sewers and rainfall, Hering report, 12-**92**
Inst C E sewers, discharges of circular and egg form, Olive, inset * v 93; sewage purific., insufficiency of chem. procs., Pfeiffer, abs. v 93 -**88**; discharge at various depths, multipliers and curves for ascertaining, Gloyne *The Eng* May 2-**90**, inset *Inst C E* * v 96; sewer air movements at Wimbledon, '88, expts., Crimp * v 97 -**89**; sewage treatment, abs. v 105 -**91**
R & Eng sewerage of cities, Mayer, May * Sep -**88** *Ann Ponts;* disposal, new method, Moor *Sc Am Sup* Nov 14-**91**; elec. purific., Gilley *Soc Arts Mass* -**90**; chem. precip. of, Hazen (full) -**91**; Oke's sewage sludge pump *The Eng* Oct 19-**88**
ABERDEEN, S. Dak., sewage pumping plant *E News* * Nov 29 -**90**
AIRE & Calder, sewage pollution of *Eng* Dec 16-30-**92**
AMHERST, Mass. sewage purific. *E News* July 21-**92**
ATLANTA sewerage *E Rec* Apr 4, 11-**91**
BAY City, West, Mich. *E News* * Dec 27-**90**

Sewerage and sewers, BERLIN sewage disposal, Lortzing system *E News* * Oct 19; by electrolysis, Webster's proc. 26-**89**; Lond. and Paris, n Dec 6-**90**; and Magdeburg, Germany, system *E Rec* Aug 1-**91**; sewage farms, Roechling, Apr 30, Aug 6-**92**, irrig., Muller, abs. *Inst C E* v 91 -**88**, Roechling, discuss., inset * v 109 -**92**

BOSTON, Mass., Mystic & Charles river valleys, report *E News* May 4-**89**; Met. Commiss. Feb 1; system, n July 5-**90**; sewers spec. Aug 29-**91**; sewage purific., water-works drainage area * Aug 4-**92**; Mystic sewage chem. treatment, Learned *E Rec* Mar 9, report, Apr 13-**89**, abs. *Inst C E* v 94 -**88** *J Assoc E Socs* -**88**. See also SEWERAGE, Mass.

BROOKLYN, N. Y., main relief, Beahan, discuss., insets *Am C E* * v 26 -**92** *E News* * Jan 2-**92**

CHICAGO, the lakes and gulf waterway, drainage report *E News* Apr 14-**88**

CHISWICK, flow of sewage, Hetherington, inset *Inst C E* * v 94 -**88**

CITY of Mexico, details, inset *E News* * Dec 5, map * 12, 19-**91**

CONEY Is., N. Y., sewage purific. *E News* * Oct 20-**92**

DISTRICT of Columbia, U. S. *E News* May 12-**90** *E Rec* Nov 22-**90**

DOSTMUND, Germany, sewage disposal *E Rec* * Dec 31-**92**

DUDLEY, England, sewage disposal works *E News* * Aug 8, Marten *Inst C E* * v 104 -**91**

DULUTH, Minn., storm sewers *E News* * Oct 25, 25; imp. *E Rec* * June 28-**90**

FRANKFORT-on-Main, Lindley *E Rec* * Aug 11-25, Sep 15, 22-**88**

HULL, England, works and pumping station, White *E News* * Feb 8 *E Rec* * July 26-**90** *The Eng* * Dec 27, 27-**89**

JACKSONVILE, Fla., Bowditch report *E Rec* * Apr 20-**89**

KINGSTON-on-Thames & Surbiton works *Eng* July 5-**89**, machin. *The Eng* Dec 14-**88**

LENOX, Mass., sewage purific. *E News* July 21-**92**

LONDON, England, sewage disposal, ed. *Eng* Apr 11; Grantham, n Nov 14-**90**; sewage question, Barlow, Sep 2-**92**; Paris and Berlin, n *E News* Dec 6-**90**; Roscoe's report on deodorization *E Rec* Sep 1, 8-**88**

LONG BRANCH, N. J., sewage purific. *E News* * Dec 22-**92**

MANCHESTER, England *E News* Oct 6, scheme *The Eng* Oct 5 -**88**

Sewerage, MARLBOROUGH, Mass., sewage purific., inset *E News* * Aug 25, Sep 1-**92**
MASSACHUSETTS, sewage disposal in, Stearns *Am C E* v 18-**88**; Mystic and Charles river valleys report *E News* May 4-**89**; Met. Commiss. Feb 1-**90**; State Bd. of Health filtration expts., report *Eng* Feb 19-**92** *E News* July 11-**91** *E Rec* Nov 23-**89**, purific. July 18, chem. precip. Aug 15 and water supply, abs. *Inst C E* v 106 -**91**. See also SEWERAGE, Boston
MEDFIELD, Mass., sewage disposal *E News* * Dec 29-**92**
MEMPHIS, Tenn., system report *E News* Apr 6-**89**, Hartford *E Rec* Mar 23, Norfolk and Charleston, Aug 10-**89**; Mar 28; sewers cleaning cost, small separate, Elliott, Nov 14-**91**
MILWAUKEE, Wis., flushing tunnel *E Rec* * Dec 8-**88**
MINNEAPOLIS, disposal, Insane hos. *E Rec* * Jan 3; No. Minn. tunnel * May 9-**91**
MT. Vernon concrete sewer, Worthen, discuss., inset *Am C E* * v 24 -**91**
NAPLES *E Rec* * July 30-**92**
NEW Orleans franchise ordinance *E Rec* Apr 23-**92**
NORFOLK, Memphis and Charleston report *E Rec* Aug 10-**89**
ORANGE, East, N. J., disposal works *E News* * Jan 5, system * 19-**89**, Bassett, Feb 15, May 31-**90**; sewage purific. * Dec 1 -**92**; *E Rec* * Jan 12, 26-**89**; system, ed. Mar 21-**91**, and water-works *Sci Am* Nov 17-**88**
PARIS, France, Lond. and Berlin, n *E News* Dec 6-**90**; submerged sewer laying *E Rec* * Apr 11-**91**; siphons of St. Louis Is., across Seine *Sc Am Sup* * Nov 15-**90** *Genie Civil, The Eng* * Feb 27-**91**
PLAINFIELD, N. J. franchise *E Rec* June 27-**91**
PORTSMOUTH, England, outfall works, Bramwell *Eng* * Sep 9 *E Rec* Oct 15-**92** *Inst M E*
PROVIDENCE, R. I., 9-ft brick sewer centering *E Rec* * Oct 31-**91**; * June 4-**92**
RANGOON, Burmah *E Rec* * Mar 15-**90**
RICHMOND, England, main drainage and precip. works, inset *Eng* * Sep 25, inset *E News* * Oct 31 *E Rec* * Oct 10-24 -**91**
ROUND Lake, N. Y., sewage purific. *E News* * Oct 13-**92**
ST. Petersburg, Sokal, abs. *Inst C E* v 102 -**90** *Woch ost Ing* -**90**
SAN Diego, Cal., Schuyler, cor. *E News* Mar 22-**90**

Sewerage, SHEEPSHEAD Bay, N. Y., sewage purific. plant, inset *E News* * Sep 29-**92**
SOUTHAMPTON, England, sewage precip. works, Bennett *Eng* * Sep 23, and refuse destructor *E News* Sep 1-**92,** classification and house refuse disposal, do., inset *Inst C E* * v 91 -**88**
SOUTH Framingham, Mass. works *E News* Nov 23-**89**; sewage purific. Aug 11-**92**
SUMMIT, N. J., sewage purific. *E News* Dec 8-**92**
TORONTO, Can., brick and pipe sewers cost, tables *E News* Dec 22-**92**
TROY, West, N. Y., system *E News* * Jan 3-**91**
WASHINGTON, D. C., sewer specs. *E Rec* Jan 31-**91**
WAYNE, Pa., sewage purific. *E News* * Nov 3-**92**
WHITE Plains, N. Y., sewage purific. plant, inset *E News* * Sep 22 * Oct 6-**92**
WOLVERHAMPTON, England, works, Berrington *Inst C E* * v 110 -**92**
WORCESTER, Mass., disposal works *E Rec* * Mar 21-**91** *E News* * Nov 16-**90**; sewage purific. July 28-**92**
Sewer pipes, Am. vitrified, strength tests *Eng* Nov 20, Howe, abs. *Inst C E* v 106 -**91** *J Assoc E Socs* -**91**; manuf. *E News* * June 23, Nov 17-**92.** See also PIPES
Sewing machine, two reel lock-stitch, D. Jones' *Eng* * May 15-**91**; elec. motor, Parkhurst *Sc Am Sup* * July 19-**90**
Shaft governor, Ball *Am M E* * v 9 -**88**
Shafting, keying, Woodruff system *Eng* * Sep 19-**90**; strength of, A. L. Jones cor. * Nov 20-**91**; hollow, formula and table *The Eng* * Dec 30-**92**
Shaw-Lefevre, Charles *Inst C E* v 95 -**89**
Shearing machines, for 30 by 9 in. slabs, Clyde Br. steel works, inset *Eng* * June 8-**88**; heavy rail and plate * July 18-**90**; Wicksteed's hot *The Eng* * Oct 2-**91**
Shear-legs, ship's, 120-ton, Clydebank Ship Bld. yard, Glasgow, inset *Eng* * Dec 28-**88** *E & Min* * Feb 9-**89**; 130-ton, Fairfield yard, Govan, inset *Eng* * Sep 19-**90**; 120-ton hydr. triple power, Port of Marseilles, Richou *Sc Am Sup* * June 2, abs. *Inst C E* v 93 -**88** *Genie Civil* * v 12 -**88**; 80-ton, Globe I. works. Cleve. *R Gaz* * Nov 11-**92.** See also SHIP-building
Sheffield industries *Eng* Aug 1, 8-**90**
Shelley, Charles P. B. *Inst C E* v 106 -**91**

Shinn, William P. (full) *Am C E* v 26 -**92,** por. *E & Min* * May 7-**92,** por., inset *E News* * Dec 20-**90**

Ship-building and yards, in Am., Wiley *Cassier's* * July -**92**; Clyde, '87 *Eng* Feb 24, Mar 16; Harland & Wolff's yard and engine works * Aug 3-**88**; Scot., '88, Jan 18; at Barrow, Sep 6; Bilbao yard * Oct 25; Great Brit., '89, Dec 20, 27-**89**

Eng shipyard machine tools * Aug 1, 15, 29 * Sep 19 * Oct 17 * Nov 7, 28 * Dec 12; U. S., ed. Sep 5-**90**; in Portsmouth dockyard, White, July 29 * Aug 5, 19 *Inst M E*; and marine eng. in '92 *Eng* Dec 23; Scot. and Ire. 30; butt connections of shell-plating, Middendorf * 30-**92**

E Mag steamship building in Am., H. See * June, shipyards * Aug -**91**; Clyde, '88 *E News* Jan 26-**89**; on the lakes, Apr 19; the world's indus. Sep 6-**90**; Newport News new shipyard, Va. * May 16-**91**; Am. competition in, Dec 29 *The Eng* Dec 2-**92**; statics of launching, Baxter, abs. *Inst C E* v 110 -**92** *U S Naval Inst* v 18 -**92**; on Pac. coast, Gilmore *R & Eng* Nov -**89**; on Great Lakes *R Gaz* Nov 4-18; launching cruisers and battleships, Baxter *Scribner's* * Oct -**92**

The Eng ship builders and engineers, N. E. coast Inst. pro. Oct 26-**88**; Lloyd's register returns, Jan 17-**90**; Clyde firms, Denny & Bros. Feb 27, May 22, Russell & Co. * Sep 4; Fairfield ship-yard, plan * June 5-**91.** See also LAUNCHING; MARINE eng; SHEAR-legs

Shipping, mercantile, of world *E News* Sep 14-**89**; Am. and English, Oct 6; Am. competition, Dec 29 *The Eng* Dec 2; business competition of Brit. ports for, Nov 11-**92**; trade of Thames river, ed. Sep 27; the world's, Universal Register *R & Eng* Nov -**89.** See also SHIPS

Ship railroads, new project *Sc Am Sup* * Aug 30-**90** *An Indus*

CHIGNECTO, the, O'Rourke *Am C E* * v 24-**91**; map *E News* * Oct 27-**88,** and profile * Sep 7, lifting docks * 28-**89**; *R & Eng* * Mar -**91**; inset *R Gaz* * Nov 21-**90**

EADS', Henderson *Sc Am Sup* May 18-**89**

SMITHS's, William *Eng* * Nov 21-**90**

Ships, elec. lighting, Fleming *El Eng* July 23; cable gear imps., Wilkinson *El Wld* * July 12-**90**; collisions at sea, ship's lights, Terry cor. *Eng* * Nov 2, Dec 7-**88**; stability and buoyancy protection, Barnaby * May 3-**89**

Eng strength of, Jenkins * Apr 11; stresses of, at sea, Read, 11; steam and hydr. machinery, B. Brown * 18; Admiralty

Ships
coef. formulas, Mansel, July 18; protection of, Barnaby, Dec 12-**90**, Jan 9; stresses in steel plating, Yates * May 22-**91**; the Santa Maria, flagship of Columbus * Aug 5; power transmiss. and distrib. in mod., Soliani, July 29, Aug 5, 26, (full) *Sc Am Sup* Dec 17-**92**

E News vessels tonnage on Great Lakes, June 6, cor. 20, Goodwin cor. July 11-**91**; the world's shipwrecks, Sep 1-**92** *Eng;* method for cal. stability, Taylor, abs. *Inst C E* v 106 -**91** *U S Naval Inst* -**91**; uses of electricity on shipboard, Greene *R & Eng* Nov -**89**; merchant, of world, May -**92**

Sc Am Sup steel and iron, corrosian and fouling of, Lewes (full) Aug 3-**89**; sailing, July 19, large sailing, of France * Aug 2-**90** *Naut Mag, Genie Civil*

The Eng propul. by air propellers, Vogt, Sept 28, n Oct 12; mercantile, development. ed. Dec 21-**88**; manip. of ship steel, ed. Aug 2-**89**; ship's bulkheads com. report, ed. Oct 9-**91**. See also MARINE eng; NAVIES; SHIP-building; SHIPPING; STEAMERS

Shops, boiler, Fairfield works, Govan *Eng* * Oct 3-**90**; Frick Co's *R & Eng* Oct -**92**. See also MACHINE — RAILROADS, shops, etc.

Shore protection *E News* * Feb 6-**92**

Sibley, George *Inst C E* v 108 -**92**

Sibley, Hiram, bust *Cassier's* * Aug -**92**; por. *El Wld* * July 21 -**88**; Thurston, por. *Sc Am Sup* * Sep 3-**92**

Siemens, Werner Von, por. *El Eng* * Dec 14, por. *El Rev Lond* * 9 *El Rev* 17 *El Wld* 17, eds. *Eng* 9, 16-**92**

Siemens, William, bk. n *Eng* Apr 5-**89**

Signal, U. S. heliograph service *Sc Am Sup* * Dec 28-**89**. See also MILITARY signaling

Silicon, det. of in ferro-silicous, occurrence in aluminum and reactions, Williams *Am Min* v 17 -**89**

Silk, artif. *Eng* * July 26-**89**; silk worms management, China, Kliene, (full) *Sc Am Sup* Nov 8-**90**; chem. nature, Wardle * Nov 28-**91**; nitrated, Vignon (full) Dec 17-**92**

Silver *Am Min* matting dry aur. ores, Austin; mining and milling at Butte, Mont., Blake; ingot melting at U. S. mint, New Or., Claussen and abs. *Inst C E* v 91 -**88**; ore assaying, Russell proc., applics. and results, Daggett, insets (very full): ore,

Silver

trough lixiviation, Hofmann (full); and gold mining, Utah, Hol lister *Am Min* * v 16, 16-**88**

Am Min argent. manganese ores, Tombstone dist., Ariz., occurrence and treatment, Goodale * v 17 -**89**; ores concent. before amalgam. and geol. of Flint Creek mining dist., do. v 18 -**90**; the Potosi dist., Bolivia, Wendt, insets (full) *Am Min* * v 19 -**91**; smelting, cord-wood in the matting blast fur., Lang; ore lixiviation plant construct., Stetefeldt, Marsac refinery, Park C., Utah, do. and abs. *Inst C E* v 110 -**92**; Chinese mining in Mongolia, Dawes *Sc Am Sup* Aug 22 *Am Min* v 20, 20-**92** *E & Min* Sep 19-**91**

Eng ore concent. mill * Aug 17 *E & Min* * Nov 10-**88**; smelting works, Zeehan & Dundas, Tasmania *Eng* * Aug 12-**92**; Chinese mining, Church *E Mag* Nov -**91**

E & Min trough lix., Hofmann cor. Jan 14-**88**, of zinc blende and galena ore (full) Feb 9-23 * Mar 9, 16-**89**; and gold produc. '87, n Jan 21; Coeur D'Alene silver-lead mines, Clayton, Feb 11; precious metal produc. and use in U. S. '87, July 21; ores lix. with hyposulphite sols. and Russell proc., Stetefeldt, bk. review, 28; and gold mining in China, Smithers' report, Sep 8; ores and minerals, cyanide of potass. as lix. agent for, Janin, Dec 29-**88**

E & Min the Tamchow mine, China, Jan 26; and gold produc., U. S. '88, Mar 2, June 15 *Locom* June; leaching, cupric chloride in, Aaron *E & Min* May 11; ores lix., Comstock, Stetefeldt, bk. review, 25; metallur. of, Eissler, Lond., bk. review, Sep 28; St. Louis, Mo., convention, Oct 26, 26, Dec 7-**89**

E & Min and gold, world's produc., Rothwell, price since 1883, Jan 4, 4, Valentine's stats. 18-**90**, Jan 3, 24, Feb 28, 28, July 25-**91**; low-grade ores concent. before amalgam., Goodale, Feb 22; matte smelting for, Torrance, Mar 22, May 31 * July 19, 26; precious metals produc., U. S. '89, May 3; and gold, future of, ed. 31-**90**

E & Min Horn Sil. mining Co. report, Feb 14; bullion refining, Gutzkow * 28 *Sc Am Sup* * Sep 12; Red mt. mines, Col., Weston *E & Min* Mar 21; and gold parting, Moebuis' electrolytic proc. at Pinos Altos, Maynard * May 9; Broken Hill mines, N. So. Wales, Rickard, Nov 7-**91**

E & Min and gold produc. '91, Jan 2; and gold miner of the Comstock * 9, lode discoverers, 16; discov. in Nev., Grosh bro's

Silver
* Feb 27; U.S. produc. '91, Apr 23; ed. 30; mining, Hale & Norcross Co. decis., pors. * June 4; ore, Comstock early working, Quille, July 23, Aug 13; argent. zinc-lead sulphides treatment, Schnable, Sep 17, 24; Barrier Range field, Australia, Boxall, Oct 8; sil. question, Nov 5-**92**
Sc Am Sup and gold working, cyanide proc. without amalgam., MacArthur-Forrest proc. (full) Aug 6-**92**; allotropic forms, Lea, July 13, Aug 17-**89**, (full) *Am J Sci*

Simpson, David L. *Inst C E* v 94 -**88**

Simpson, James *Inst C E* v 98 -**89**

Skill and art in the heathen era, Fanning (full) *Sc Am Sup* Mar 30 -**89** *J Assoc E Socs*

Slade, Frederick J., Raymond, por. *E & Min* * Oct 17-**91**

Slag-cement manuf., Redgrave *Inst C E* v 105 -**91**

Slag grinding machine, dustless *The Eng* * Apr 24-**91**

Slags, thermal properties, prelim. n, Howe *Am Min* * v 18 -**90**

Slag wool, F. M. Jones *The Eng* July 27-**88**

Slate, U. S. produc. '89 *E & Min* Aug 16-**90**; quarries, Pa., Merrill *Sc Am Sup* * Jan 19-**89**

Slaughter, Edward *Inst C E* v 105 -**91**

Slavery question, dissensions in Am. churches over, Sturges (full) *Tech Q* Apr -**91**

Slide rule, and pump cals., Cox *E & Min* Aug 15-**91**, mechan. comput. by, do. *E News* Dec 20-**90**, practice, equivs. for cals., do. Jan 3, Cox *Pwr* * Jan-June, Aug -**91**; Gieseler *R Gas* * Mar 9-**88**

Slot machines, Root's (box) telephone aut. pay station *El Rev* * Nov 22-**90**; Lynde's aut. *Eng* Jan 25-**89**; nickel-in-the-slot machines, Aughinbaugh (full) *Sc Am Sup* * Apr 11-**91**. See also AUTOMATIC machines

Smeed, E. C., Haupt *E Mag* Oct -**92**

Smellie, Hugh *Inst C E* v 107 -**92**

Smithsonian Institution, Kay *Sc Am Sup* Oct 5-**89**. See also under SCIENCE

Smoke prevention, Sennett on, Booth *El Rev Lond* * Oct 7; boiler furs. means *E & Min* Aug 6-**92**, the steam jet for *E News* * Apr 4; Sep 19, Dec 19-**91**, Mar 26, June 30, July 14, 21; the Hawley down-draft fur. * Jan 30; on Chic. tug-boats, n July 21; Sargent ap. Nov 10-**92**

Smoke prevention

E Rec com. report, ed. Aug 13, Dec 3; smoke consumer, n * Nov 12-**92**; aut., Vulcan fur. *Pwr* * Nov -**90**; *R Gaz* Jan 8, Feb 26, 26; St. Louis com. report (full) Apr 1-**92**; condensation of carbon particles, Irvine *Sc Am Sup* Mar 7-**91**; manufacturing smoke, Davis, Nov 29-**90** *Chem Tr J*; ed. *The Eng* July 26-**89**; Ackroyd-Willoughby's preventer, trial * May 15 -**91**; ed. Jan 8; in boiler furs., Sennett, n * Aug 26-**92**. See also BOILERS, furnaces, smoke preventing

Snow removal from city streets, ed. *E Rec* Jan 9-**92**. See also R's, snow ploughs

Snow-shoes, Norwegian Skee, North *E News* * Jan 18, true Nor. Ski * Mar 29, n *Sc Am Sup* * Feb 22 * Apr 26-**90**

Soap indus., Ivorydale plant (full) *E Rec* * May 2; Penn. R. specs., C. Dudley (Chem. applied to R's) *R & Eng* Dec -**91**; resin as an emulsifying agent, Collier *Sc Am Sup* May 3; anal. June 14-**90**

Soap bubbles expts., Boys *Sc Am Sup* * July 14-**88** *Eng Mechanic*

Soares, Plotino *Inst C E* v 101 -**90**

Societies, Soc. of Arts, Lond., hist. *Eng* July 24, 31, Aug 7, 14, 28, Sep 4, 25, Oct 16, Nov 20-**91**; Soc. Arts, Mass., list members, pro. *Tech Q* Apr -**92**. See also ENGINEERS, Civil — Mechan; LOCOMS., Am. Master Mechanics; MINING engineers; R's, Car Builders, Master — Master Mechanics; ROYAL Soc; TECHNICAL Soc., etc.

Soda nitrate, market *E & Min* Jan 4-**90**; Nichol's report, abs. Jan 17-**91**. See also NITRATES

Soils, contrast in col., high and low latitudes, Crosby *Tech Q* Apr-**91**

Solar radiation intensity, compar. with elec. arc, Langley *El Eng* Jan -**90**. See also SUN

Sound, diffraction of, Stevens *F Inst* * June -**89**; wave theory of, Hall *Locom* Mar, Apr, Aug; vel. and adiabatic compression, Mott *Sc Am Sup* June 13; Helmholtz's theory of consonance, Cross *Tech Q* Dec -**91**, least number of vibrations necessary to det. pitch, do., Maltby, Oct; vel. measurements by *The Eng* Aug 26-**92**

Sounding ap., Belloc's *Sc Am Sup* * Oct 31-**91** *Genie Civil*

South Sea Islands *Eng* * Jan 18, 25 * Feb 1, 15, 22 * Mar 1-**89**

Space, constitution of, Hirn, bk. review *Eng* Nov 8-**89** *Sc Am Sup* Jan 11, DeV. Wood, Apr 5-**90**

Spain, (Spanish) Armada defeat in 1588 *Sc Am Sup* * Aug 25-**88**; new customs tariff *The Eng* Sep 23-**92**

Spectroscope, spectroscopic researches, ed. *Eng* Apr 5-**89**; Halsted observ. * July 22-**92**; *Locom* July -**89**; table, construct., Miller * June 23 * Nov 17-**88**, with fluid prism, do. * Apr 27-**89**

Spectrum anal., Macadam *Sc Am Sup* June 9-**88**. See also LIGHT, spectrum

Speed, recorder, elec., Barrus *Am M E* v 9 -**88**; trials, register for, Weaver *El Eng* * Apr 1-**91**; and distance recorder, Kapteyn's *Eng* * Mar 29; recorder, Buss' Tachymeter * July 12, 12, Paris exhib. * Aug 30-**89**; mile records, n *E Mag* Apr -**91**, do. of world *E News* June 9-**92**; Willis' speedometer *Sc Am Sup* * Jan 14-**88**; indic., Heath's self-timing *The Eng* Oct 26 -**88**. See also R's speeds

Speed regulator, Foote's aut. intermediate *El Eng* * Oct 22 *El Rev* * Dec 6 *El Wld* * Oct 25 *Pwr* * Nov -**90**

Spellier, Louis H. *F Inst* Nov -**91**

Spelter produc., Europe and U. S. *E & Min* Mar 31-**88**, '90, Mar 28-**91**; indus. '89, Jan 4-**90**, Jan 3-**91**

Spencer, Charles T. *Inst C E* v 95 -**89**

Spencer, George *Inst C E* v 97 -**89**

Sperry, Elmer A., por. *El Wld* * June 15-**89**

Spice, Robert P. *Inst C E* v 97 -**89**

Spike forging machine, the Burton elec. system *El Eng* * Jan 27-**92** *El Rev* * Sep 13-**90**

Spikes and drift bolts, holding power of, expts. *E News* Sep 26-**91**. See also R's spikes; TRACK

Spindles, spinning, Stockton Bates' support for, com. report *F Inst* * Aug, tests, Webber, do. Sep -**90**

Spon, Ernest *Inst C E* v 104 -**91**

Sponges, Florida *Sc Am Sup* May 3-**90**

Spontaneous combustion, human, Stockwell (full) *Sc Am Sup* Oct 5-**89**; Tallock, Apr 18-**91**

Sprague, Frank J., por. *Cassier's* * Aug -**92**; inventions defence (full) *El Rev Lond* Apr 6-**88**; por. *El Wld* * Sep 7-**89**

Springs, spiral, deflection, Young *Inst C E* * v 101 -**90**; formulas for, Penn. R. *R Gaz* * Nov 15-**89**; helical, cal., Lecuw * Jan 15-**92**; metal coils, friction of. H. Shaw *Sc Am Sup* * Nov 10-**88**; cal. of, Reuleaux table and formulas * Dec 14 -**89**

Sprinklers, aut., det. of sensitiveness, Nagle *Am M E* * v 11-**-90.** See FIRE protection, sprinklers

Stamp cancelling and post-marking machine, the Ethridge *E News* * Oct 5-**89**

Standards, J. W. See *Am M E* v 10 -**89.** See also WTS. and measures

Standfield, John *Inst C E* v 101 -**90**

Standpipes (water-works water towers) *E News* Cal. redwood, C. Allen, * Apr 28; Stephens, Oct 6; thickness of plates for, K. Allen, Dec 15-**88**; aut. gate closing ap. * Sep 28-**89**; Brooklyn, N. Y. tower, proposed * Feb 7-**91**; Worms, Ger. * Feb 13; the Sheffield * Mar 19; Des Moines, Iowa * Apr 9 -**92**

E Rec Bellevue tower * June 1 * Aug 10; Pullman, Ill. * Dec 28-**89**; prize designs, insets * Mar 15-29 * Apr 5-26-**90**; Defiance, destruction, foundation * Apr 11, 11; the Norton, Vyrnwy aq., Liverpool * Oct 3; Aurora, Neb. * Nov 21-**91**; Worms * Jan 30; Des Moines, Iowa * Feb 6; Mannheim, Ger. Sep 3-**92**

Inst C E Seneca Falls, N. Y., bursting, abs. v 91 -**88** *E Rec* Nov 12-**87**; standpipes, Parker *Lehigh Eng J* Apr -**88**; tower at Worms *The Eng* * Apr 29-**92**

Stanford, Walter H. C. *Inst C E* v 97 -**89**

Stanley, William, Jr., por. *El Eng* Aug 20-**90**

Stanton, Frederick S. *Inst C E* v 108 -**92**

Stanton, John, por. *E & Min* * Sep 19-**91**

Starch, iodide of, Stocks *Sc Am Sup* Jan 14-**88**

Stars, computing apparent places for latitude work, differential method, Preston *F Inst* Apr -**89**

Statter, Thomas *Inst C E* v 109 -**92**

Statistics, Dictionary of (universal) '92, Mulhall, bk; an easy lesson in, Atkinson *Forum* Jan -**89**; statistical tabulation by machinery, Pidgin *Soc Arts Mass* -**89**; how to make popular, do. -**91**; graphic, notes, Dewey *Tech Q* Oct -**88**; study of in colleges and schools, Walker, Feb -**90.** See also CENSUS taking tab. machine

Statues, Franklin, Allison, inset *E Mag* * Mar -**92**; Quanhtemoc, Mex. *E News* * Feb 11-**88**

Steam *Am M E* identification of dry, Denton * v 10 *E News* Feb 9; flow in tube, Peabody *Am M E* * v 10 -**89**; tables of properties, Dwels.-Dery; and water power, compar. cost, Mann-

Steam

ing, Main * v 11 and *E & Min* June 1-**89** *E News* Jan 24-**91**; *Pwr* Feb, Mar; flow through orifices, Peabody *Am M E* * v 11 -**90**; reaction wheel performance, Webb * v 12 -**91**

Cassier's steam power and the coal bill, Pray * Nov * Dec -**91**; future of, Colvin, Feb; dry, mechan. methods of securing, Carpenter * Aug; exhaust util. from elec. light station *El Wld* * Feb 20 -**92**; effic. at high pressures, Beaumont *E News* Feb 9-**89** *F Inst* Dec *R Gaz* * Nov 2 *Brit. Assoc., Eng* * Nov 2-**88**; district distrib. in U. S., Emery, Mar 29; rationalization of Regnault's expts., Gray * July 12-26, discuss., insets (full) *Inst M E* * July *The Eng* July 19-**89**

E News total h. p. of world, n May 26-**88**; power of world, n Sep 21-**89**; power plants, Ivorydale, O. *E Rec* * Oct 17, 31 * Nov 7, 28-**91**, Barrus * Nov 5, Dwight Manuf. Co., do. * 5, 12, Curtis, Davis soap works Cambridgeport, Mass. *R Gaz* * Dec 9 *E Rec* * Dec 3, U. S. Col. exhib. * 17, Borden cotton mills, Fall River, Mass. * 24, test, 31-**92**; steam h. p. cost, Pray *F Inst* June, July -**90**; steam on common roads, McLaren. discuss., inset *Inst C E* * v 103 -**91**; super-heated, applics. for engines, expts., Meunier, abs. v 108 -**92**; ether-pressure, theory of thermod. applied to, Gray, insets *Inst M E* * July -**89**

Pwr 7200 h. p. plant, Spreckels sugar refinery * June; cost of fuel for power, table, July -**90**; as a by-product, Prentiss, Mar; moisture measuring in calorimetry, Carpenter * Mar-Sep, Dec -**91** * Jan -**92**

R Gaz the Hussey reheater * June 8-**88**; econom. limit of pressures, Nagle, Nov 13-**91**; steam plant effic., D. V. Wood *Sc Am Sup* Sep 1-**88**; momentum in steam pipes, Denton, n * June 22-**89** *Steven's Indic*; pressure of saturated, Peabody *Tech Q* May; flow in tube, do., Buttolph, Oct; econ of low pressure *The Eng* Feb 17-**88**. See also BOILERS; ELEC. lighting stations; ENGINES; MARINE—PUMPING engines, etc; R's, elec., power stations

BLOWERS, or exhauster, expt. with, Brunton, n *Inst C E* * v 92 -**88**; the Argand and McClave grate *Pwr* * Aug -**91**. See also BLOWERS and fans

BOILERS, the Zell *El Rev* * Aug 31-**89**. See BOILERS

CALORIMETER, universal, Barrus *Eng* * July 25-**90**. See CALORIMETERS

Steam CARRIAGE, Serpollet's phaeton *Eng* * Mar 13 * Aug 14 *R & Eng* * June * Aug -**91** *Sc Am Sup* * Sep 22-**88**, tricycle * Jan 11-**90** *The Eng* * July 10 * Sep 25-**91**

CRANE, 150-ton, Woolwich arsenal *The Eng* * Oct 9-**91**. See CRANES

ENGINE Maker's Soc. *Eng* Feb 22-**89**

ENGINEERS, Stationary, Nat. Assoc. *Pwr* Sep -**88**

ENGINES, the Sickles *El Wld* Feb 22-**90**. See ENGINES

FIRE engines, hand carriage *The Eng* Dec 7-**88**; for Sydney, performance * Oct 9-**91**. See also FIRE engines

FITTINGS, eccentric *Locom* Mar -**88** * Aug -**90**. See also PIPES, etc.

GAUGES, recording pressure, Bristol *Am M E* * v 11 -**90** *E News* * Dec 7-**89** *The Eng* * Jan 23-**91**; Calkins *Cassier's* * Apr -**92**

HAMMERS, notes on, Chomienne (very full) *R & Eng* * June-Dec -**88** * Jan - Sep; the Pencoyd * Dec; and hydr., forging machines, C. Sellers *R Gaz* Aug 2-**89**; Nasmyth's *The Eng* * May 16-**90**. See also FORGING machines; HAMMERS

HEATING, Worthen discuss., inset; district systems; Emery, insets *Am C E* * v 24, 24-**91**, in U. S., discuss., inset (full) *Inst C E* * v 97 -**89**, abs. v 106 -**91** *F Inst* Mar *Sc Am Sup* Mar 31, Apr 7-**88**; and hot water plant, compar. test, Carpenter *Am M E* * v 11 -**90** *E News* * May 24; non-conductors effic. Jan 25-**90**; aut. air valves * Aug 24-**89**

E Rec Wash. Univ., C. Jones Feb 18-**88**; proportioning radiating surface, Carpenter, Dec 13-**90**, Magovern cor. Jan 10-**91**; C. Jones, abs. *Ints C E* v 92 -**88** *J Assoc E Socs* -**88**; district, Prall system, Meier *Sc Am Sup* Aug 25; Boston Heating Co's plant, Abbot * Nov 17, 24-**88** *J Assocs E Socs*; Kirkaldy's system *The Eng* * Aug 29-**90**. See also CARS, heating, steam

INJECTORS. See INJECTORS

JACKETS. See ENGINES, steam jackets

JOINT, Moran flexible *E News* * Aug 29 *R Gaz* * July 31 -**91**

LOGGER, Glover & Chandler, n *R Gaz* * July 26-**89**

LOOP, the, Kerr *Eng* * June 13 *E News* Aug 2-**90**, (full) *E Rec* * Oct 24, 31, Osborne cor. *F Inst* * Oct -**91**, (full) *Sc Am Sup* * Mar 19-**92**

Steam PIPES, for collieries, Davis *Am M E* * v 11 -**90**; water rams, Emery *Cassier's* Dec -**91**; copper, Parker *Locom* Nov, Dec *Sc Am Sup* Sep 1 *Eng* Aug 3, cor. * v 31 -**88**; non-conducting coverings, tests, Haacke cor. * May 24, June 14; explosion at Deptfort, Kent, England, report, * Aug 16-**89**; lap welded, hydr. tests of, Oct 30-**91**

E Rec non-conducting coverings tests, Ordway report, Jan 3, Collins, Oct 31-**91** *E & Min* Dec 6-**90**; the Ferranti *The Eng* * Mar 13 *E Rec* * 28-**91**; underground, protection of, Carpenter * Dec 10-**92**; supports *Locom* * Aug -**90**; loss of heat from uncovered (full) Sep-Nov -**92**

Pwr hangers * Feb -**88**; diameters, Jan -**90**; for high pressures * Jan * Feb -**92**; non-conduct. coverings tests, Luttgen *R Gaz* May 4-**88**; bent copper, strength of *The Eng* Sep 14-**88**, Woodthorpe report * Aug 16-**89**; * Apr 14, Vining, cor. * May 8-**91**. See also PIPES

PRESSURE regulator, Foster's *R Gaz* * Mar 20-**91**

PUMPS, direct acting, use of steam expansively in, Holloway *Am M E* * v 11 -**90** *E Rec* * Nov 30, Dec 7-**89** *Am Eng'r*; Hall duplex *E & Min* * Dec 7; for boiler feeding *Locom* * Sep -**89**. See also PUMPS

REDUCING valve, the Mason *Sci Am* Mar 9-**89**

SEPARATORS, Barnard's, Stratton's *E News* * Jan 18-**90**; effic. of, tests, Carpenter report, Sep 12 *Pwr* * July -**91**

SHOVEL, portable, Bay C. Indus. works, Mich. *E News* * July 5 -**90**

STAMP, the Tamarack *E & Min* * Jan 28-**88**

TRAP, the Korting *Eng* * May 24-**89**; the Expandisc *The Eng* Mar 30-**88**

TURBINES, note on, Webb *Am M E* v 10 -**89**; compound *Sc Am Sup* * Feb 18-**88**

DOW'S compound motor *El Wld* * Feb 28-**91** *E News* * Feb 27-**92** *Pwr* * May -**91** *R Gaz* * Jan 24 *Sc Am Sup* * Apr 19 *The Eng* * Mar 14-**90** *J Assoc E Socs*

LAVAL'S *Sc Am Sup* Apr 23-**92**

PARSON'S compound condensing, trials, Ewing report *Cassier's* * Dec *El Eng* * Nov 30 *El Rev Lond* Jan 8 * Nov 18 *El Wld* * Jan 30 * Dec 10 *E News* * Feb 27 *R Gaz* * Dec 2-**92**; *Eng* * Jan 13 * Nov 16-**88** *E & Min* * Jan 19-**89**, discuss., insets *Inst M E* * Oct -**88**

YACHTS. See YACHTS, steam

Steamboats, on Rhine *The Eng* Aug 10; small pass., Plymouth harbor, Nov 9-**88.** See also STEAMERS, paddle

Steamers, ship's protection against foundering from injury to their shells and use of armor, Barnaby *Am Min* v 19 -**91**; points in the philosophy of, Durand *Cassier's* * Nov -**92**; building in Am., See *E Mag* * May -**91**

Eng oil-carrying, stability of, Jenkins * May 17, 24-**89**; power and speed relations, Edmonds cor. Feb 14; steamship propulsion, Mansel cor. Mar 7, laws do. June 13; transalantic speed, Aug 15, ocean racing, 29, Sep 5-**90**

Eng paddle, fast * Jan 9; laws of propul., Mansel, Mar 6; loading, effect of on form of vessels, Phillips * Apr 10; Atlantic records, early strs. 10, 24, May 1, 8, table, June 19, July 10; water-tight bulkheads in, ed. June 26; and yachts comparison, examples, A. Jones * July 3; oil-tank, Eldredge * 31, Aug 7; mercantile, types and proportions of, Martell, Aug 7, 14; bulkhead's spacing and construct., com. report * Oct 2; Atlan. liners, past, present and future * Dec 4-**91**

Eng water-tight bulkheads, Martell * Apr 15; steadying vessels at sea, Thornycroft * 15; the Atlan. ferry, its ships, men and working, Maginnis, bk. review, July 29; hydr. davitts, H. M. S. Vulcan * Nov 18-**92**; ocean, high speed in, Schieldrap *E & Min* Mar 1 *Sc Am Sup* Apr 19-**90**

E News steering, Hornig's direct power system * Mar 23; new class of Atlan. Aug 17-**89**; ice-breaking str. Nogat, Vistula river, Devrient * Sep 6, Pearsons cor. * Oct 25; steering, the Kunstadter screw * 25-**90**; Atlan., dimens. Oct 20-**92**

Inst C E ice-breaking, for winter nav., Runeberg * v 97 -**89**; Rhine goods traffic, Schnell, abs. v 99 -**90** * *Zeit Bauwesen* -**89**; the race across the Atlan., Dyer (prog.) *Littell's* Apr 23-**92** *Scot Rev;* Lloyd's register *Locom* Apr; fast Atlan. speed and dimens. June, July -**89**, Atlan. record (fast) Aug -**91**; design, experimental aid in *R & Eng* Dec *Sc Am Sup* Sep 28 -**89** *Steamship*

Sc Am Sup first Atlan., Fuller, Mar 10-**88**; first ocean * May 9; Atlan. passages, table, Aug 15-**91**; Atlan. (dimens.) * Jan 16; 24-knot, Feb 13-**92** *The Eng;* building of an ocean grayhound, Rideing *Scribner's* Apr -**89**

The Eng vessels, relation between power and speed, Mansel, Dec 23-**87**, Mar 30, laws of propulsion, do. (very full) July 27, Sep 7, Oct 12, Nov 23-**88**, Jan 25, May 24, July 5, Aug 2, 30,

Steamers

Oct 11, Dec 6-**89**, correction, do. cor. Oct 31-**90**, det. of coef. between power and speed, do. Apr 10, power expend. in and rel. effics. June 19, resistance of, Dec 11-**91**, propul. July 1, Atlan. liners, n Sep 2, paddle wheel and screw, compar. effic. Oct 7 -**92**

The Eng Atlan., ed. Aug 3, Turner cor. 31; iron and steel stern strengthening of, Sep 14-**88**; screw shafts repairing, str Tartar * Jan 18; Atlan. racing, ed. Sep 6-**89**; paddle, high speed * Aug 1-**90**; funnels, ed. June 19-**91**; L. Geneva pass. * Aug 5; Atlan., future of, ed. Nov 18, cor. Dec 2-**92**. See also MARINE eng. — boilers — engines; NAVIES; NAV., India inland; STEAMBOATS

ALFONSO XII *Eng* * Feb 15, inset * Mar 1-**89**

ANN Arbor R. car transfer *R Gaz* * Aug 19-**92**

ARGENT. Gov't., stern-wheel, inset *Eng* * Dec 16-**92**

BALTIMORE, dimens. *The Eng* Sep 14-**88**

BOSPHORUS, paddle, steel, for *The Eng* * Nov 7-**90**

BOSTON, Nova Scotia & Boston pass., inset *Eng* * Sep 18-**91**

BRITTANNIC, White Star unprecedented record *The Eng* Sep 12 -**90**

CALAIS-Douvres, Lond., Chat. & Dover R. *Eng* * June 14-**89**

CITY of Berlin *The Eng* Feb 3-**88**

CITY of New York, Inman *Eng* * Mar 1-16, inset * June 22, machin. * Aug 3, 24: dimens. *E News* Aug 11; *R & Eng* * Sep *Sc Am Sup* * Apr 14 *The Eng* July 13, 27-**88**

CITY of Paris, Inman *Eng* Apr 26-**89**, accident, ed., inset * Apr 18, ed. June 27, Mueller cor. * July 11-**90**; ed. * May 8-**91**; pumping mach. of *E News* Apr 20-**89**; accident, Gillham, ed. Apr 26, 26-**90**; *R Gaz* May 17-**89**; *The Eng* Oct 26-**88**; accident * Apr 18, 25, June 20, inertia stresses, Greenhill, 27, 27-**90**

CLYDE, Roy. Mail Stm. Packet Co., inset *Eng* * Sep 26-**90**

COBRA, Royal Mail paddle *Eng* * Aug 2-**89**

COLUMBIA, Hamburg-Am. twin-screw, 10,000 ton *Sc Am Sup* * Jan 4-**90**; insets *The Eng* * Oct 25 * Nov 8-**89**

CONNECTICUT, Prov. & Stonington, inset *R & Eng* * Aug -**88**

DOUNE Castle and Lismore C., Castle line, inset *Eng* * Oct 2-**91**

DUNOTTAN Castle, So. African mail *Eng* * Jan 2-**91**

ELETTRICO, pass. *The Eng* Nov 16, 16-**88**

EMPRESS of India, Can. Pac. R., inset *The Eng* * Sep 5-**90**

Steamers, FRIESLAND, Red Star liner *Eng* * Nov 8-**89**
FURST Bismarck, Hamburg-Am., twin-screw, insets *Eng* * Apr 1, 22-**92**
GLENGYLE and Glenshiel *The Eng* July 5, 5-**89**
GREAT Eastern, value to break up, n *E News* Dec 15-**88**; fate of, Jan 2-**92**; last days of (full) *Sc Am Sup* * Nov 28 *The Eng* * Oct 30-**91**
HYGEIA, paddle pass., inset *Eng* * Nov 7 *The Eng* * Oct 17, inset * Nov 7-**90**
IBEX, Great West. R., twin-screw *The Eng* Sep 18-**91**
INDIA, engines and boilers, inset *Eng* * May 1-**91**
IONA, trials, Kennedy report *The Eng* May 8, 22-**91**
ISLANDER, Napier, inset *Eng* * Sep 28-**88**
KOH-I-Noor, Thames excursion paddle *Eng* * July 15 *The Eng* * 8, 8-**92**
LANCASTRIAN, Leyland line *The Eng* Oct 30-**91**
LE Louvre, central screw *Sc Am Sup* * Nov 12-**92**
LORD of the Isles, Clyde pass., insets *Eng* * July 1, 15-**92**
LYDIA, Lond. & So. W. R. Channel str. *Eng* * Sep 4-**91**
LYNX, Antelope and Gazelle, Great West. R., inset *Eng* * May 30, engines and boilers * June 13-**90**
MAJESTIC, White Star line *Sc Am Sup* * Oct 11-**90**
METEOR, trials, Kennedy report *The Eng* * May 3, ed. 10, *Inst M E* pro. 17-**89**
MODJESKA, twin-screw, inset *Eng* * Oct 4-**89**
NOMADIC and Tauric, White Star, inset *The Eng* * July 24-**91**
NORMANNIA, Hamb.-Am. twin-sc. *Eng* Jan 31, inset * Aug 29 -**90**
OPHIR, Orient Stm. Nav. Co. (Austral.), twin-screw *Eng* * Dec 11 *The Eng* Sep 18, inset * Nov 20, 20-**91**
PARIS and Rouen, Lond. & Br. R., Channel *Sc Am Sup* * May 18, inset *The Eng* * Mar 15, Sep 13, 13-**89**
PELOTAS, Brazilian, engines and b's, inset *Eng* * June 10-**92**
PENINSULAR, Penin. & Oriental *Eng* Dec 7-**88**
PERU, Pac. Mail, launching curves of *The Eng* * Sep 16-**92**
PLYMOUTH, Fall River line *Eng* * July 31-**91**
PURITAN, Fall River line, steel, elec. light decorative features *El Wld* * Aug 3; Am. *The Eng* July 26-**89**; *Eng* * Jan 16, 23-**91**
RE Umberto *The Eng* Nov 2-**88**
ROME, Penin. & O., lengthening *The Eng* Oct 2-**91**
RUAHINE, New Zeal. Shipping Co. *The Eng* * Apr 1-**92**

Steamers, SCOT, So. Africa Roy. Mail, Union S. S. Co., twin-screw *Eng* * July 3, 10, 24 *Sc Am Sup* * Aug 8 *The Eng* June 5, insets * July 3, 10-**91** *Industries*

SPREE, No. German Lloyd *Eng* Apr 24-**91**

SULTAN, raising of, ed. *The Eng* Sep 13-**89**

TARTAR, speed trial, Mansel, n *The Eng* Dec 23-**87,** June 29-**88**

TEUTONIC, White Star, inset *Eng* * Dec 19-**90,** cor. Jan 9, (full) *Sc Am Sup* * Feb 7, 14-**91** *The Eng* Aug 9-**89,** inset (full) * Dec 19-**90**

TYNWALD, Isle of Man Stm. Packet Co. *The Eng* * Aug 28, inset * Sep 11-**91**

ULUNDA, raising *The Eng* * Mar 27-**91**

VILLE de Douvres, trial, Kennedy *The Eng* * May 13, 20-**92** *Inst M E*

WAESLAND, Red Star line *Eng* Dec 20-**89**

WHALEBACK, 'C. W. Wetmore,' Am. cargo *Eng* * July 31-**91,** Goodall * Apr 29-**92** *The Eng* * Aug 7-**91**

WHITE Star S. S. Co's *Eng* Jan 25-**89.** STEAMSHIPS, See STRS.

Steel, properties and use in structures and heavy guns, Metcalf, bk. *Am C E, E Rec* Dec 17, 31-**92**; and iron, compressive strength, Marshall *Am C E* Aug -**87,** abs. *Inst C E* v 92 -**88**; hardening, structural, Cunningham, discuss., inset (full) *Am C E* * v 27 -**92**

Am M E plates, injury by punching or shearing, Hawkins; temper, reduction by electro-plating and bending, Reese, discuss; tested shortly after rolling, Felton, v 9, 9-**88**; piping of steel ingots, Crane * v 10 -**89** abs. *Inst C E* v 97 -**89**; castings, Gantt *E News* June 20 *Am M E* * v 12; manganese-steel, Howe * v 12 -**91** *E & Min* * Aug 22 *Soc Arts Mass* -**91**; structural elastic curve and treatment of, Henning *Am M E* * v 13 -**92**; behavior, notes, and *The Eng* Mar 7, Apr 11, May 2-**90**

Am Min manganese-steel, method for es., Julian; colorimetric carbon test, inorganic standards for, T. Robinson; open-hearth, recent imps., A. Hunt (full) * v 16, 16-**88,** abs *Inst C E* v 94 -**88**; Henderson, Brainerd *Am Min* v 17 -**89**; open-h. manuf., notes, Shed, v 18 -**90**

Am Min Bess., sulphur in, Cabot; open-h., physical and chem. equations of proc., Campbell (full); German works and rolling mills, notes on imps., Daelen *E & Min* * Nov 8, 15-**90,** inset *Am Min* * v 19; Bess. proc., notes on, Howe (very full);

Steel

Darby proc. of recarburization, Thielen * v 19 -**91** *E & Min* July 5 * Oct 25-**90,** Jan 17, Apr 18-**91,** and ed. *E News* * Oct 18, 18 *Sc Am Sup* * Nov 22-**90**; ingots and moulds handling in Bess. works, Curtis; Imperatori proc. expts. at Croton mag. mine, N. Y., Nau (full) *Am Min* * v 20, 20 -**92** *E News* Oct 17-**91**; mild, fusion of, Carulla *Cassier's* Feb -**92** *Eng* Oct 23-**91**; recalescence in, E. Thomson *El Rev Lond* May 31-**89** *El Wld*

Eng manganese-steel, Hadfield, Sep 7-21, dis., insets (full) *Inst C E* * v 93 *Sc Am Sup* Apr 7-**88**; Brymbo works * May 10; hydr. pressure treatment, Greenwood, 17; Firming Co., at Paris exhib. * July 26; hardening and tempering of, Roberts-Austen, Sep 27, (full) *Sc Am Sup* Oct 26, behavior under stress, Carus-Wilson *Eng* * Dec 13-**89**

Eng alloys, Riley, Jan 24 *Sc Am Sup* Mar 22; manuf., Galbraith *Eng* May 23; aluminum in, Keep, 23; cost, Wright, Aug 22-**90**; basic, ed. Jan 30; ordnance tests for, Anderson, May 15, 15 *Sc Am Sup* June 6 *The Eng* May 15-**91**; 10 years produc., Great Brit. Mar 11; basic expts., White (full) June 3, 3-**92**

E & Min metallurgy of, Howe (very full) Jan 14 - * May 5, 19 * June 9-23 * July 7-21- Oct 6, 13, 27 * Nov 3-17 * Dec 8-22 -**88,** Jan 19, 26 * Feb 9, 16 * Mar 9-30 * Apr 13, 20 * May 11 -**89,** sup. (full) Jan, bk. review, June 28-**90**

E & Min steel making, cost in Ala., Phillips & Claghorn, Mar 2; compressing, Boulton ap., Crane * May 18; basic Bess. proc. in U. S., Phillips, July 13-**89**; Bess. practice, curious, Howe, June 28, in Robert vessels, notes, Aug 30; open-h., novelties in procedure, Howe, Sep 13, Bess. proc. notes, do. * Oct 4, how invented and perfected, H. Bessemer, 11-**90**

E & Min U. S. produc., census, Nov 8-**90,** '90, Jan 3; det. of carbon in, Blair, Apr 4; steel making in U. S. before 1810, Durfee, Nov 7 *Pop Sci* Oct; low, tests and experience (Prussia), Mehrtens report * Dec 12-26-**91,** abs. *Inst C E* v 110 -**92**; basic, world's produc. '91, n *E & Min* May 21; steel billets cost, compar., U. S., Great Brit. and Europe, Oct 1; basic Bess. plant, Pottstown I. Co., Hartshorne * Nov 5-19-**92**

E News direct proc. tests * Jan 21; 20 years of open-h. experience, Koch, June 9-**88**; tests (Carbon I. Co.) Apr 6; drifting tests of structural * 27, May 18; hydr. pressure treatment, Greenwood, July 6, dis., inset (full) *Inst C E* v 98 -**89**

Steel

Sc Am Sup Aug 10 *The Eng* May 24; making in England *E News* Sep 7; soft, severe tests of * 28; open-h. bridge manuf., Shed, Oct 5-**89**; testing, rate of speed in, Flint, Apr 19; mild, made by Thomas proc. 26; Henry Bessemer's story of invention of Bess. proc. Oct 18; Edgar Thomson works and blast furs. * Nov 1; produc. 1880-90, Cens. bull. 8-**90**

E News hardening of surface, Haney proc. * Oct 24-**91**; mild, for structural purposes, Henning * Jan 2-16, Craighill cor. * 30; soft, in bridges, Apr 2; soft, bending tests and proofs of qual., Kreuzpointner * May 12, fire-box *R Gaz* May 27; cost *E News* * July 28; open-h. and Bess. * Sep 15-**92**

E Rec basic, expts. with, Aug 20; plate punching expts., Benjamin, Dec 24 *R Gaz* Nov 11-**92** *J Assoc E Socs;* Bess. manuf., R. Hunt *F Inst* * May -**89**; Robert-Bess. proc., Metallur. arts at Paris exhib., Garrison * Oct -**90**

Inst C E open-h., use and testing for boiler-making, Goodall, discuss. (full) * v 92; Terni works, Italy, ed. *The Eng* Nov 23, machin. of, Savage, insets *Inst C E* * v 93; mild, effect of rolling and wire-drawing, H. Allen * v 94 -**88**; Bess. proc. at Nischnje Saldensk, Ghrum-Ghrzhimailo, abs. v 100-**90**

Inst M E and steel guns, Chernoff, July **91**; U. S. produc. '87 *Locom* Mar -**88**; phosphorus det. in, Dudley *R & Eng* * Dec -**92**; bars, plain and twisted, rel. strength tests, Gilmore *R Gaz* Mar 15-**89**; cost and st. rails, Wright report, Feb 20; castings, good and bad, ed. * July 24-**91**

Sc Am Sup at Glasgow exhib. Sep 15 *The Eng* July 27, Nov 2-**88**; heat treatment of, Howe (full) * Apr 6-**89**; U. S. produc., Sweet, Nov 22-**90** *Cens Bull* 13; aluminum-steel, Hadfield *Sc Am Sup* Apr 4-**91**; open-h. castings, Herrick, Mar 26 -**92** *Iron Age;* domestic steels for naval purposes, Eaton (full) *Soc Arts Mass* -**90**; elastic limit momentary depression at two critical temps., Howe *Tech Q* Dec -**88**

The Eng Bess. converter controlling ap., Watts * June 6; U.S. produc. Nov 14; basic open-h. manuf., Davis, Dec 19-**90**, dis. Jan 23; Dowlais works, at Cardiff, England * Nov 13-**91**.

See also ALUMINUM-steel; IRON and steel; RAILS, steel, manuf.

Steel trellis machine *Eng* * July 25-**90**

Steel, William H. *Inst C E* v 100 -**90**, 103 -**91**

Stenotelegraph, the Cassagnes, Chenut *El Wld* * July 19-**90**

Stephens, Frederick C. *Inst C E* v 96 -**89**

Stephenson, Henry P. *Inst C E* v 101 -**90**
Stereotyping, quick proc. *Locom* June *Paper Wld, Sc Am Sup* Aug 4-**88**; Bolas (full) Oct 25 * Nov 1-**90,** Feb 21-**91**
Stevenson, George W. *Inst C E* v 99 -**90**
Stevenson, Thomas *Inst C E* v 91 -**88**
Stileman, Francis C. *Inst C E* v 98 -**89**
Stock (quotation) printer, the Wiley *El Wld* * Jan 14-**88**
Stokers, aut. conveyor *Eng* * June 14, 28; Roney *Pwr* * Aug *St R J* * Aug -**89.** See also BOILERS, stokers; MECHAN. stokers
Stollmeyer, André B. *Inst C E* v 107 -**92**
Stone, Mason's stone-breaker *Eng* * Nov 25-**92**; Gov't. contracts *E News* June 2; and cement, crushing strength, Baker, 23-**88**; cost of dressing, Cooke, Dec 13-**90**; cements and bld. material, method of testing resist., Durand-Claye *E Rec* May 11, abs. *Inst C E* v 95 -**89** *An Ponts* * v 16 -**88**; stone-cutting and quarrying by wire, abs. *Inst C E* v 95 -**89**; sawing machines, abs. v 106 -**91**; Ark. syenites tests, Wins *R & Eng* Jan -**91**; artificial 'Ferroid,' Poole *Sc Am Sup* Nov 8-**90** *J Assoc E Socs;* circular saw *Sc Am Sup* * May 2-**91**; artif. silica making, Aug 20-**92.** See also BLUESTONE; BUILDING stones; GRANITE; LIMESTONE indus; SLATE, etc.
Stone, Charles S., Raymond *Sc Am Sup* Mar 23-**89** *E & Min*
Stone, Thomas W. *Inst C E* v 109 -**92**
Stoneware, adaptation to chem. ap., Rix *Sc Am Sup* * July 25 * Aug 1; manuf. Orton, Dec 19-**91.** See also EARTHENWARES, porous
Storage batteries, elec., or accums., Salom *Am Min* * v 18 -**90**; Reckenzaun *El Rev Lond* Jan 6, June 22, July 6, 13, Aug 3, 24, Nov 9 *El Rev* Dec 1-**88** *Sc Am Sup* Feb 2-**89** *El Eng* Sep, Oct -**88,** Jan; litigation, Apr; defects of lead secondary, Duncan * June *El Rev Lond* * July 19, dis. (full) *E Wld* * June 15-**89**
El Eng in train lighting, Brown, dis. July; regulating accums. in elec. lighting, methods, Prescott (very full) * Nov, (full) *El Rev Lond* * Nov 22, 29, Dec 6, (full) *El Rev* * Nov 9, (full) *El Wld* * Nov 9, dis. 23; chem. of, Frankland, Oct 25-**89,** Aug 22-**90** *El Rev* Nov 2-**89,** expts. Sep 20-**90** *Sc Am Sup* Nov 2-**89,** Nov 1-**90** *El Eng* Nov, Dec -**89**
El Eng working effic. of secondary, Ayrton, Aug 13, (full) *El Rev Lond* * July 18, 25 * Aug 1. 8, (full) *El Wld* * Aug 9-30 *E News* * Sep 6; aut. reg. of accum. circuits *El Eng* * Oct 1; Elec. Stor. Bat. Co's system * 8-**90**

Storage batteries

El Eng chem. of, Ayrton * Jan 7-**91**, (full) *El Rev Lond* * Nov 28, Dec 5-19, (full) *El Wld* * Dec 13-**90**; (second.) Robertson *El Rev Lond* Dec 11-**91**, (full) *El Wld* * Jan 9-23, (full) *Sc Am Sup* * Jan 23 *Soc Arts Lond*, *El Eng* Jan 13; Am., Donaldson-Macrae, n * Apr 20-**92**

El Rev Lond (accums.) Waltenhofen, Oct 19, abs. *Inst C E* v 94 -**88**; Hoppe, bk. review, *El Rev Lond* Nov 30-**88**; alkaline accums. Jan 18 *The Eng* 18; sec. and secondary curs., Parnell *El Rev Lond* Feb 22; litigation, Apr 12; ed. May 10; traction, Bracken, Aug 30, Bell, Oct 18; at Paris exhib., Reckenzaun * 25 *Sc Am Sup* * Dec 14-**89**

El Rev Lond (accums.) management, Pumpelly, Apr 25, July 4 *El Wld* Apr 12, 26, May 31, July 14-**90**; in commercial work, index references to periodicals, J. S. Brown, Dec 5 *El Rev Lond* Dec 25-**91**; causes of changes of elec. mo. force, Gladstone * May 27 * June 3; chem. of lead accums., Darrieus * June 10-24, trial, Aug 5; Epstein accums. tests, July 29; indus. accum. Nov 4-**92**

El Rev Mut. Elec. Mf'g Co. * July 20-**89**; gelatinous electrolytes for, Schoop, Aug 9 **90**; researches, Streintz, Jan 24 -**91**

El Wld machinery for manuf., Madden * Oct 27-**88**; Bates, Feb 9; Preece (full) May 25; influence of density of acidulated water in, Paget, June 15; Dallas, July 13-**89**; elec. plants cal., Bracken's accum. diag. * Nov 15-**90**; Frankfort exhib., Hering * Nov 21-**91**

Eng accums. vs. transformers, May 25-**88**; *E News* * May 25-**89**; power, cost, Kapp *E Rec* Mar 7; new accum. plate, Pike *F Inst* * Apr **91**; traction *R Gaz* Dec 30-**92**; *Sc Am Sup* Mar 2-**89**. See also R's, elec, storage bat.

ACCUM. Co. vs. N. Y. & Harlem R., decis. *El Wld* Apr 23-**92**

BRUSH, windmill accum. plant *El Eng* * Dec 24-**90**; pat. July 29-**91**; legal decis. (full) *El Rev* Mar 29-**90**; suit, Aug 1, pats. 15-**91**; Elec. Accum. vs. Julien Coxe's decis. (full) *El Wld* Mar 30-**89**, Mar 29-**90**, Aug 1-**91**; effic., Higgins *Tech Q* * Dec -**87**

DESMAZURES accums., Reynier, abs. *Inst C E* v 92 -**88**

DETROIT, the, tests, Duncan *El Wld* * Mar 23 *Sc Am Sup* * Mar 9-**89**

JULIAN accum. *El Rev Lond* * Jan 6-**88**

Storage batteries, KHOTINSKY accum. *El Eng* * Sep 14, 21, 28, Oct 5 biog. sk. * Nov 9-30-**92**
KNOWLES distrib. system *El Wld* * July 20, plates, Oct 12-**89**
LACOMBE bat. decision *El Wld* Nov 9-**89**
LAURENT-Cely accum. *Eng* * Mar 28-**90**
MACRAEON'S *El Wld* Feb 9-**89**
SCOTT-Sisling charging system *El Rev* * Sep 26-**91**
TUDOR accums. in cen. stations, Schoop *El Eng* * Nov 16-**92**
WADDELL-Entz system *El Wld* * May 16 *Sc Am Sup* * June 6 -**91**
WINKLER, the *El Wld* * Apr 9-**92**
Storms, Am. tornado of *Eng* Mar 27, Apr 25-**90**; conditions causing tornado, Hazen *E Mag* * Oct -**91**; meteorol., a contrib. to, Tatham *F Inst* June; hail-storm at Phila. Oct 1-**89,** Houston, Nov; and rain, Hazen *Sc Am Sup* June 15-**89.** See also RAINFALL
Stothert, John L. *Inst C E* v 104 -**91**
Stoves, effic., Lunge *The Eng* Sep 6-**89** *J Soc Chem Ind.* See also GAS-stoves; MALT drying stove
Strain, Charles J. *F Inst* May -**92**
Strains, measurement of, Mallock *Eng* * Nov 21-**90.** See also TESTING machines, etc.
Street railroads, Rap. Tran. Commiss. report to Mass. Legislature, Apr 5-**92**; stats., cens. bull. *El Wld* May 9; elec. cars speed in city sts., Hewitt * Dec 19-**91**; accidents, N. Y. city, ed. *E News* Mar 10-**88,** inc. in, ed. July 11-**91**
E Rec and pavements, Stayton, Dec 3-31-**87,** Jan 7, 21, Feb 4, 25, Apr 7, May 26, June 9, 16, Oct 13, Dec 8, 29-**88,** Apr 13, June 8, 15, Aug 3, Sep 14, Oct 5, Dec 7-21-**89,** Jan 4-**90**; Fairchild, bk. review, Aug 20-**92**; elec., in cities (extent) *R & Eng* Nov -**90** *El Eng;* cost of op., cens. bull. *R Gas* May 22; sociology of, Cooley, Oct 23; and steam, rel. value, tables, Mansfield *Soc Arts Mass* -**91,** (full) *St R J* May -**91**
St R J taxation, W. Smith, Nov -**88**; conductor's way-bill * Apr -**89**; horse trams, Fairchild (full) * Oct * Dec; public and state treatment of Co's, Nov -**90** *Scribner's*
St R J notes (various cities) Jan; charters, franchises, stocks and bonds, Fairchild (full) Apr; Boston and foreign cities compared, Whitney, May, June; op., rules, Fairchild (full) June; the car mile unite, Bowen, Sep. cor. Oct; foreign notes, Frankfort elec. exhib. Nov -**91**

Street railroads

St R J accounts forms, Jan, Mar, bk-keeping, Fairchild, July: U. S. mileage and cars, '90-91, table, Apr; taxation, May; a model roadbed and wiring, Baumhoff report, Nov; Security car fare register, n * Dec; traction cost, Brunton cor. *The Eng* Sep 30-**92.** See also BREWERY tramways; R's, elec; TRAMWAYS

AM. Assoc. pro., Buf. (full) *El Rev* Oct 25-**90**; Oct 24, 31-**91**; Cleve. (full) Oct 29-**92**; *El Wld* Oct 26-**89**; Buf. (full) Oct 25-**90**; Pitts. (full) Oct 31-**91**; report, Oct 29-**92**; *E News* Oct 27; *R Gas* 28-**92**; (full) *St R J* Nov -**88**, Nov -**89**, Oct, pors. * Nov -**90**, Nov -**91**, souvenir sup., pors. * Oct, Nov -**92**

BERLIN tramways *St R J* Nov -**91**, traffic, May -**92**

BERNE, Mekarski system, Bertschinger, abs. *Inst C E* v 105 -**91** *Schweiz Baus* -**90**

BOSTON, West End, elec. *El Rev* * Aug 27; report abs. Nov 19 -**92** *El Wld* Aug 20, Nov 19-**92**; and foreign cities compared, Whitney, abs. *Inst C E* v 99 -**90** *El Eng*, *St R J* May, June -**91**; report, Dec -**90**; * May, Dec -**91**; report, Dec -**92.** See also R's, elec., Boston

BROOKLYN (full) *St R J* May -**92**

CAR-houses and stables, location and construct., Wyman *St R J* Nov -**88**

CARS, car-gear for mod. speeds, self-propelled car, Macfarren *Am M E* v 11 -**90**; Robinson radial *El Eng* * Oct 1-**90**; safety fender *E News* * July 26-**90**; fenders for, Swain * Feb 21-**91**; Pullman's *R & Eng* * Nov -**92**

St R J Dewey's elec. heater * July -**89** * Jan; Burton elec. heater * Feb -**90**; center aisle open * July -**91**; car building, Fairchild (full) * Mar * Apr; car brakes, Van Vleck * Apr; West End fender, Boston, n * Nov -**92**; sleeping car *Sc Am Sup* * Jan 28-**88**

CAR starters *E News* * Jan 11-**90**; Akers & Lindsey's *Sci Am* Mar 2-**89**; Anspach cor. *St R J* * Feb **90**; Vereker & Yeates' *The Eng* * Aug 16-**89**

CHICAGO, report *E News* Jan 31-**91**; West, map *St R J* * July; City * Aug, Mil. ave. power plant * Sep -**89**

CLEVELAND *St R J* sup. * Oct -**92**

CURVES, spiral or transition, effect to reduce shock, Woolley *E News* Nov 1-**90**; transition, Balt. * Nov 10-**92**; and switches, measurements of, Rydler *St R J* * Oct -**89** * Mar; tramway spiral, Gribble * Oct -**90.** See also R's, curves

Street railroads, EUROPEAN, stat. *E News* Feb 2-**89**; practice Howes, Nov 21-**91**

GERMAN *E News* Oct 13-**88**; *St R J* May -**91**

GREAT Brit., and tramway working, ed. *Eng* June 22-**88**; England, cost of traction *E News* Oct 24; and Ire. *St R J* May; Great Brit. & Ire. Tramways Inst. Aug -**91**

HORSES' feeding *St R J* May -**88**; horse power cost, State Engr's report, table, Nov -**90**; stable notes, Nov -**91**

KANSAS City, extent, *E News* Jan 19-**89**; rap. tran. *St R J* * Mar -**90**

LIVERPOOL, McGhie *St R J* June -**92**

LOCOMOTIVES, compressed air, Hardie cor. *Eng* June 8-**88**; meter g. tramway, Paris exhib., inset * Dec 27-**89**; English *E News* Mar 1-**90**; steam, Brussels exhib. *The Eng* Oct 19-**88**; Belpaire steam tramway engine * May 31-**89**

LONDON tramways *St R J* Aug -**91**

MASS. stats. n *El Wld* Mar 19-**92**; R. Com. report *R Gaz* Feb 21-**90**; traffic growth, Mansfield *St R J* May; legislation, July -**91**; reports, Jan -**92**. See also ST. R's, Boston

MOTIVE power, Sears, *Cassier's* Oct *Am C E* v 27 -**92**; compressed air, Jacobus *E Rec* July 11 *Am Min* * v 19 -**91**; elec., com. report (full) *El Wld* Sep 26-**91**; the Mekarski compressed air tram-car *Eng* * Mar 23-**88**; low pressure air motor for, ed. * Mar 14, 21-**90**; comp. air for, Haupt *E Mag* Aug, Sep *R Gaz* Aug 19-**92**

E News the Mekarski comp. air, Lond. * May 12-**88** * May 24, 31-**90**; Judson pneu. propulsion system, Oct 26, inset *St R J* * July; stor. bats. and motors, Dec 7-**89**; for cities, table, Aug 30; mixed methods, Ontario, Cal. * Dec 13; comp. air, Nogent tramways, Demoulin, abs. *Inst C E* v 99 -**90**

Sc Am Sup Connelly gas motor * Oct 6, *The Eng* * Sep 30 -**92**, *St R J* * Sep -**88**; motors other than animal, cable and elec., Winsor report, Nov *St R Gaz*, *Sc Am Sup* Nov 16-**89**; Rowan's motor for cheap traction * Jan 9-**92**; compressed air propul. Chester * Apr 26 *The Eng* * Mar 21-**90**; first principles *St R J* * May; elec., finan. conditions of success, Barr report, Nov -**89**; steam, air and gas trams, Fairchild (full) * Jan; mo. power, a standard of comparison, Hampton * Mar -**91**. See also CABLE R's; COMPRESSED air motors; GAS motors; R's, elec.

Street railroads, MULHAUSEN-Ensisheim tramway, Dollfus, abs. *Inst C E* v 91 -**88** *Bull Soc Mul* July, Aug -**87**

NEW York city & Brooklyn, cost of op., table *St R J* July -**91**; June * Aug, Sep -**92**

NEW York State Assoc. pro. *El Rev* Sep 27-**90**, Sep 26-**91**, Oct 1-**92**; *El Wld* Sep 27-**90**, (full) Sep 26-**91**; (full) *St R J* Oct -**88**; op. expenses, table, Aug; sup. Sep 15, Oct -**91**; Oct -**92**

PARIS, King *St R J* * May, building and repair shops, do. * July * Aug * Nov, Dec -**91**

PITTS. & Allegheny, Pa., map *St R J* * May -**90**

RAILS, continuous rail joint *E News* * Apr 21; * May 12-**88**; B'way Cable * July 18-**91**; White's * June 14, section, B'way and 3d ave. cable tracks * Aug 9; the Gibbon duplex * Nov 15 -**90**; standard rail head, Nov 3-**92**; Johnson girder, works *St R J* * June -**90**; expan. of continuous, expts., Moxham * Nov -**92**

RICHMOND Union pass., inset (full) *St R J* * June -**88**

ST. Louis, map *St R J* * Feb -**90**

SIAM, City of Bangkok, Westenholz *St R J* Aug -**91**

SYDNEY, New So. Wales, rap. tran. plans *St R J* July -**92**

TRACK, imp., Tratman *E News* July 20-**89**, insets (very full) *Am C E* * v 22 -**90**; Gribble, dis., insets (very full) * v 24-**91** *E News* * Dec 20-**90** *St R J* Feb, Gibbon * Apr, May -**91**; White's *E News* * June 14-**90**; wear, Arnall * Sep 8-**92**; Gibbon's duplex * Nov 15-**90**, com. report, insets *F Inst* * June -**92**; permanent way, More (full) *Inst C E* * v 103 -**91**; construct., Fairchild (full) *St R J* * May * June -**92**. See also ST. R's, rails

TRAMWAY Inst. of Great Brit. & Ire. pro. *St R J* * Aug -**92**

SWITCHES, the Rowell *El Wld* * Oct 19-**89**; turnouts, Harrington, Nov 19-**92**; switchwork, Detroit *St R J* * June; measurements of, Rydler * Oct -**89** * Mar -**90**

VINCENNES-Ville Evrard comp. air *Sc Am Sup* * Mar 17-**88**

WASHINGTON, D. C., map *St R J* * July -**90**

Streets, numbering plan, Chic., proposed *E News* Nov 16-**89**; dept., N. Y., Feb 1; cost of lighting, Kansas C. June 28; subways at B'way and Fulton sts., N. Y., inset * Nov 1-**90**; the ten-block system for numbering country houses, Bancroft, Jan 31; cleaning, Paris, Jan 17, Aug 22 *Sc Am Sup* Sep 5 -**91**

Streets

E News grades fixing, Aug 25, cor. * Sep 8; cleaning, cost and methods of paying, Washburne report, 29; cleaning, Phila., '91, n Nov 10-**92**; use of pub. ways by private corporations, Powers *Arena* May -**92**; st. digging *Eng* * Sep 26-**90**

E Rec construct. and care, Greene, Mar 1, 8, cleaning cost and methods, 1, 8; lighting, N. Y., Love, Apr 5; cleaning and refuse disposal, Nov 29-**90**; cleaning, com. report, Mar 28, Wash., D. C. Oct 10-**91**; dept., Boston, report, Apr 23-**92**

F Inst and pavements, Haupt, Dec -**89**; watering and use of sea-water for sewer flushing and san. purposes, Cockrill *Inst C E* v 110 -**92**. See also under names of cities; ELEC. wires, underground; MUNIC. eng; PAVEMENTS; ROADS; SEWERS; WATER-works

Street sweeping machine, Valentia, Spain *Sc Am Sup* * Mar 24-**88**

Stress and strain defined, ed. *E News* June 2, cor. 9-**92**; stress-diags. of solid structures, R. H. Smith, inset * *Inst C E* * v 96-**89**

Strike, cost of a, C. B. Q. R. *Eng* June 28; London laborers, ed. Sep 6-**89**. See also LABOR

Stivolinski, Ferdinand de, por. *E & Min* * Oct 31-**91**

Strong room, steel, for Spain *The Eng* * Oct 2-**91**

Stroudley, William (full) *Inst C E* v 99 -**90**

Struggle for existence, ed. *Eng*? Feb 10-**88**

Struts, strength of, McCabe cor. *R Gaz* * Apr 22-**92**

Stubbs, William H. *Inst C E* v 102 -**90**

Submarine mines, Bucknill *Eng* Nov 28, Dec 5-**90**. See HAR. eng

Sudden phenom., observation of, Langley *Sc Am Sup* * Sep 7-**89**

Sugar, works, Auckland, New Zeal. *Eng* Feb 3-**88**; machin. imps. *E & Min* * July 5-**90**; sorghum, indus., Cowgill report *Sc Am Sup* * Feb 18; beet and indus., Gehring (full) Sep 29-**88**; chemical, July 20-**89**; manuf. in Cuba, July 26; synthetical expts. in sugar series, Fischer, Sep 13-**90** *Am Chem J*

Sc Am Sup sugars, standards for polarimetric es. of, U. S. report, Crompton * Oct 3; making by diffusion proc., Stubb's report * 24; sugar items, Dec 12-**91**; cane, juices class., Deeming, July 16; Demerara produc., 20 years imps., Bellairs, Sep 24 -**92**; cane, influence of temp. on spec. rotation of, det. by Polariscope, Andrews *Tech Q* May; sugar mill rollers *The Eng* * Nov 29-**89**

Sulphite pulp, in Am., n *Sc Am Sup* Aug 2, boiling, Dec 6-**90** *Chem Tr J*; fiber, see LIME sulphite fiber manuf.

Sulphur, dioxide, De V. Wood; expt. det. of latent heat of, Jacobus *Am M E* * v 12, 12 -**91**; deposits of So. Utah, du Faur *Am Min* July -**87,** abs. *Inst C E* v 92 -**88**; mines of Sicily, duration of, abs. v 91 -**88,** Carroll report *E & Min* Sep 1, 8 *Sc Am Sup* May 26-**88**; spec. resist., Monckman *El Rev Lond* Dec 28-**88**

E & Min produc. in Sardinia, Mar 30-**89**; volumet. es. in burnt pyrites, Watson, May 24-**90**; produc., Adams, Jan 2-**92**; physiol. and therapeut. action of, Shoemaker *Sc Am Sup* Oct 4-**90.** See also UTAH, sulphur

Sulphur Is., New Zeal., Macivor *E & Min* June 2-**88**

Sulphuric acid, 20 years prog. in concent. of, Adams *Am Min* * v 16 -**88**; sulphurous acid manuf. in Upper Silesia, Eilers * v 20 -**92**; sulphuric acid and alkali manuf. prog. *E & Min* May 24-**90,** and sulphurous manuf., Brit. alkali trade notes (full) * Apr 11, 18-**91,** sulphuric (manuf.) Newbury *Sc Am Sup* Apr 27-**89** *Am Chem J.* See also CHEMISTRY, sulphuric acid

Summers, Thomas *Inst C E* v 96 -**89,** v 99 -**90**

Sun, solar radiation intensity, compar. with elec. arc, Langley *El Eng* * Jan -**90**; sun-dials for low latitudes, Cumine *R & Eng* * July -**91** *Sc Am Sup* * Feb 4-**91 ?**; discov. of platinum, Hutchins, Jan 14; distance and constitution, June 2; energy util., Weston's ap. * Dec 15-**88**; solar surface in last ten years, Perry, Sep 21-**89**; sunheat and sunlight, Rogers, June 14-**90**; a great magnet, Hiscox * Aug 20; total eclipse, 1893 * Dec 3-**92**; photog. of solar prominences, Hale *Tech Q* Nov -**90.** See also ASTRON; SOLAR

Sun motor, Ericsson *R & Eng* * Sep *Sc Am Sup* * Sep 15-**88** *Nat.*

Surveying, N. Y. State, final results of triangulation of, Weed, Parsons, Albany, '87, bk; bench marks, expts. on stability of, Cooley, dis. *Am C E* v 20 -**89**; deep rock cuts, method of taking cross-sections in, by triangulation, Watkins, insets * v 22 -**90**; imaginary boundaries, Raymond *Am Min* * v 18 -**90**; photographic, and co-ordinate, Stanley (full) * v 20 -**92** *E Rec* * July 2-**92**; the ordnance, methods and proces., Wilson *Eng* Feb 27-**91**; U. S. Geolog., costly, Wolcott *E Mag* Nov -**92**

E News New Jersey state survey, Apr 14; transit field notes keeping, best method, cor., ed. Sep 29-**88**; plotting contours. Lorini, cor., diag. * Feb 23; making topog. relief maps, cor 23; resurvey of So. Amboy, N. J., Hill * Apr 13; traverse, Bassell cor. * Dec 7-**89**

Surveying

E News field-books, notes, Rothwell, Apr 5; acreage table for comput. right of way areas, June 14; grades at st. intersections, cor. * 21; Brit. ordnance, Oct 18; prob. * Nov 1; the Porro telescope for stadia work, J. B. Johnson * 8-**90**; Roanoke, Va. * Jan 9 * June 23; field sheet for topog. work * July 28; surveyor's qualifications, Gov't. Cape Col., So. Africa, Aug 4-**92**

E Rec how to tell a good instrument, Lietz, Apr 11; St. Louis, Mo., topog. Oct 3-**91**; topog. methods, K. Allen * Feb 6-**92**; Tacheometry, or rapid, Brough *Inst C E* * v 91; plane-table, econ. use in topog., Pierce, dis., inset (full); chaining, imp. systems, W. Thompson *Inst C E* * v 92, 92 -**88**

Inst C E Hawaii, Windward, prelim. in new countries, Gribble; rapid, Topham; in Australian colonies, Vickery, v 95 -**89**; by vertical angles, probable errors, Airy; triang. errors, short method of distrib; France, leveling, Jimels, abs. * v 101, 101 -**90** *Genie Civil* v 17 -**90**

Inst C E land, astron. as applied to, Downes * v 108; spirit leveling of Switz., Messerschmitt, abs. v 109 -**92** *Schweiz Bauz;* Italy, geodetic map *R & Eng* * Nov -**88**; France, geodetic work, Aug -**89**; prob. * Dec -**90**; hand telescope for stadia-work, Richards *Tech Q* * Apr -**92**. See also INSTRUMENTS; TUNNEL surveying

Swallow, James S. *Inst C E* v 101 -**90**

Sweet, John E., por. *Cassier's* * Apr -**92**

Switzerland, stat. *E News* Aug 3-**89**

Sylvanite mine, Col. *E & Min* * Dec 15-**88**

Sylvester, James J., por., Cayley (full) *Sc Am Sup* * Apr 13 -**89**

Szegedin, Town of, reconstruction (after flood), Stübben, abs. *Inst C E* v 92 -**88**

Tabulating, elec., Hollerith system, com. report *F Inst* * Apr -**90**; statistical tab. by machinery, Pidgin *Soc Arts Mass* -**89**. See also CENSUS taking

Talc *E & Min* May 25-**89**

Talking machine. See PHONOGRAPH

Talman, James J. *Inst C E* v 110 -**92**

Tank sluice with equilib. valve, Larmunie *E News* * Feb 14 -**91**

Tannin, chestnut wood bark, Trimble *F Inst* Oct -**91,** May -**92** *Sc Am Sup* Nov 14-**91**

Tanning, elec., Worms & Bale ap. *El Eng* * Nov 26; creosotic acid employment in, Hauff *Sc Am Sup* May 3; anal., Muter * Sep 6-**90**; materials of Europe, May 23; by aid of electric., Rideal (full) * Aug 8-**91**; plants capable of yielding materials, Mafat, Oct 8-**92**; applic. of alpha-sulphonic acid of naphthaline to bating and puring of hides, Burns *Tech Q* July -**91**; theory and practice, Salomon, Apr -**92.** See also ELEC.—LEATHER tanning

Tarbotton, Mariott O. *Inst C E* v 91 -**88**

Tar furnace, Anderson *Sc Am Sup* * Feb 11-**88**

Tariff and the constructive arts, Thurston *Cassier's* Jan -**92**

Taxes, U. S. *E News* June 1-**89**

Taylor, John *Inst C E* v 109 -**92**

Teaching of science, com. report (full) *Sc Am Sup* Jan 25, Feb 1-**90.** See also SCHOOLS; SCIENCE

Technical Soc. of Pac. Coast, Geldern, pors. *Cassier's* * Oct -**92**

Telegrams and storms, Slingo *El Rev Lond* Jan 23, 30, Feb 6-20-**91**

Telegraph *El Eng* wire, hard drawn cop., durabil., Maver, Apr -**88**; line adjust., Delany * Dec *El Rev* * Nov 30 *El Wld* * Apr 27 * Nov 30, multiplex, new sys., Patten's (full) *El Eng* * Mar-**89** * June 18; circuits, Jones' main office * Dec 17-**90**; writing tel. * June 3-**91**

El Eng mod. Am. ap., F. Jones * Mar 30, May 25 * June 22 * July 27 * Aug 3, 17; wire joints, breaking strain in hard drawn cop., Jones, June 1; type, the Am. n * July 27; cable, Burke relay and transmitter * Dec 7-**92**

El Rev Lond R. survey system, Gilbert * May 18; transmiss. limit, Moon, Aug 10; submar. cables and ocean temps., Bright, Nov 16-**88**; cables, of world, Feb 15; Siemen's recording ap. for compact Morse writing * Mar 8; Submar. Co. 29; ocean probs. and conditions, Apr 5; trans-atlan. cable routes * Aug 2, map *El Wld* * July 27; high vs. low speed, finan. compar. *El Rev Lond* Aug 16, Linckens *El Rev* Sep 7; cable manuf. early hist. *El Rev Lond* Dec 13-**89**

El Rev Lond submar. cables, aut. reversal signaling on * Feb 7; protection, lightning guards, Lodge * May 16-30; elec. curs. in conductors, Bennett * July 25; sub. cables, interrupts. and repairs, '88 89, table, Aug 22-**90**; prog., '96, Feb 6, in England,

Telegraph

Preece, Sep 18; sub. cables, India-rubber core in * Mar 20; pictorial * Dec 4-**91**; ap. constants, Moon, Apr 29; sub. cables, double differential relay, Raymond-Barker * July 22-**92**

El Rev hist., Vail May 5 *Century* Apr -**88**; cables, broken ocean, Oct 5; multiple, synchronism in, Morse, Nov 16; cable manuf. hist., Barrett, 23-**89**; tournament (fast sending) * Apr 12, 19; curs. in conductors, obs., Bennett * Aug 23; writing, prins. of, Morse * Nov 15-**90**

El Rev and telephone, inventors of, Gray addr. Apr 18 *El Wld* 25 *E Mag* June 20 *Sc Am Sup* 20; and pat. stats., Brit. *El Rev* June 27; musical, Hachenberg, por. * Nov 14; a pub., Hale, Dec 5-**91** *Cosmopol;* in Am. *El Rev* Feb 20-**92**

El Wld dynamo-elec. machines in, West. Un. bld., Maver * Feb 11, 18; quadruplex, imps. do. * May 19, 26 * June 2, cor. * Oct 27; trans-pac. cables, proposed, table, July 14; Gray telautograph * Aug 11; with pulsatory and undul. cur. sigs., Maver * 25 * Sep 8, 22 * Oct 6; and telephony, Jacques' simul. system * Nov 17-**88**

El Wld ocean probs. and conditions, Weatherbee * Jan 26; imperfect earth in circuits, phenom., Kenelly * Mar 16; line construct., Paris exhib. * Nov 9-**89**; quadruplex, Healy * Jan 18; submar., Webb (full) Mar 1, (full) *Sc Am Sup* Apr 19; fast sending contest *El Wld* * Apr 19; signaling across rivers, India, Melhuish * May 10; nationalizing, Wiman, Dec 30 -**90**

El Wld electric., galv., mag. and teleg., chron. hist., Mottelay (very full) * Apr 18-Dec 26-**91**, Jan 2-Feb 27, Sep 3, pors. * 10-Oct 22-Dec 31 etc. -**92**; the phonopore, Langdon-Davies *Sc Am Sup* * May 18 *The Eng* * June 21-**89** *El Wld* * Mar 7; and teleph. indiv. selection on elec. circuits call sys. * July 11; Gov't., Rosewater (full) Dec 12, Gov't. control, Foote, 19 -**91**

El Wld pictorial, Trotter * Jan 16; the Wentz line adjuster, Rosenbaum * Feb 20; lines earth cur. disturbs., Finn * May 14; cable relays, Judd * Nov 5-**92**; multiplex, the phonophore *Eng* * Apr 19; at Paris exhib. * Aug 16, 23 * Oct 11, Post Office, Oct 25, Nov 1-**89**

E News the Am. inventors of the, ed. Apr 14, birth of the elec. 21; the Finley helio-teleg. 28-**88**; trans-Atlan. cable lines * Mar 29; the world's lines, Oct 25; cables, internat. sys., Henniker, 25-**90**

Telegraph

F Inst the writing, Gump, Oct -**88**; cable, Delaney * July, (full) *Sc Am Sup* * Aug 31 * Sep 7-**89**; foreign curs. balancing effects, Fletcher *Inst C E* * v 94 -**88**; sub. cables resist. measurement, Rouillard, abs. v 95 -**89**; sub. Pac. cable, projected *Locom* Nov -**91**; Gill-Alex. indiv. call *R Gaz* * Mar 13; secret service indiv. call * Aug 28-**91**

Sc Am Sup Morse and first line, Feb 25-**88**; trans-atlan. cable lines * Apr 26-**90**; transmiss. of messages through the air without wires, Trowbridge * Feb 21; between Great Brit., Europe, Am. and the East, Niven * Mar 28; first message, Vail, Nov 14-**91**; of to-day, Buckingham *Scribner's* July -**89**

CHINA, and R's, Hitchcock *E News* * Nov 17-**92**

DELANY'S sys. of private line *El Eng** July 20-**90**; aut. *El Wld* * Feb 2; line adjusting *R Gaz* * Nov 1-**89**

EUROPE, Gov't. tels. of, Rosewater *El Eng* Dec 9, dis. 16; Niven *Sc Am Sup* * Mar 28-**91**

MERCADIER multiplex sys., abs. *Inst C E* v 106 -**91**

PARIS-New York Co. *El Rev Lond* July 29-**92**

PATTEN'S multiplex sys. *El Wld* * Jan 26, (full) * Feb 23, dis. Mar 9-**89**

POSTAL, Brit. Post Office *El Rev Lond* Apr 5-**89**; *El Rev* Dec 5, Gov't. control, Rosewater, dis. (full) 12; Great Brit. sys. *The Eng* * Dec 18-**91**. See also POSTAL telegraph

SPECTRO-tel., Dresing *El Rev Lond*, *El Wld* * July 21 *Sc Am Sup* * Aug 4-**88**

STENOTELEGRAPH, the Cassagnes (stenography at a distance), Chenut *El Wld** July 19 *Sc Am Sup* * Aug 16-**90**

TYPE printing, Wright & Moore's *El Rev Lond* * Mar 1 *Sc Am Sup* * June 8-**89** *Iron*

WESTERN Union Co., U. S., reports *El Eng* Nov -**88**, Dec -**89**, N. Y. equip. (full) Jan 27-**92**; reports *El Rev* Oct 19-**89**, Oct 22-**92**

WEST Indies, competition map *El Rev Lond* * Dec 26-**90**

Telegraph Engr. Soc. pro. *El Rev Lond* Jan 13-27, Feb 3, 17, 24, Mar 2-16, 30, Apr 20, 27, May 4, 18, 25, June 18; *Eng* May 25-**88**

Telegraphophone, the Wheless *El Wld* * Sep 14-**89**

Telemeter system *El Wld* * Sep 21-**89**; Fiske's (marine dist. instrum.), Brylinski, abs. *Inst C E* v 106 -**91** * *An Telegr* -**91**; Gautier's pocket (rapid dist. measuring), Robbins *Tech Q* * May -**89**

Telephone *El Eng* transmitting speech by interrupted elec. curs., Kintner * Jan *El Rev Lond* * Jan 20, 27; and electric light and power circuits, elec. relations, Lockwood *El Eng* Oct -**88**; interference cases (very full) Mar; induced cur. strength with magneto-teleph. transmitter, Cross, May -**89**

El Eng induction * Jan; eng., Carty, May 21 *El Rev* May 24; spec. induc. capac., Jacques *El Eng* Oct 1-**90**; inductive disturbs. in circuits, Carty * Mar 25, dis. Apr 15 *El Rev Lond* Apr 10 *El Rev* * Mar 28, *El Wld* * 28, dis. * Apr 11 *Sc Am Sup* * May 9, expts., Kennelly *El Eng* * May 6, 13-**91**; signals, selective or indiv., Lockwood * June 8 *El Rev* * June 18 (full) *El Wld* * 11; eng., Webb *El Eng* * Sep 7; connecting stations with exchange office by single line, Zetsche * 21-**92**

El Rev Lond batteries, Pickernell, Oct 19 *El Rev* Sep 15-**88**; telephony, Hibbard *El Rev Lond* Oct 18; induction, Carty * Dec 6, dis. *El Rev* * Nov 30 *El Wld* * 30 *Eng* * Dec 20-**89**; French *El Rev Lond* Jan 10; exchange construct., Pickernell, Oct 17-**90**; receiver, influence of strength of magnet in, Cross * Feb 20; telephoning great cities, Bennett (full) * Sep 4, 11, 11, ed. Oct 2, 16, Nov 13 *Eng* * Sep 11; and telegraphy, prog. in England, Preece *El Rev Lond* Sep 18-**91**; domestic telephs. * May 13-27-**92**

El Rev limits of speaking teleph. lines, Wietlisbach, May 18; Paris exhibit, Sargent, Sep 21, convention, 21; Enzmann's telephonic relay and phonopore * Nov 2-**89**; principles underlying acoustic telephony, Cross, Feb 8; convention (full) Sep 20; Co's corporate organization, Hall, 20; Root's (box) aut. pay station * Nov 22-**90**; the McCluer toll-box * Jan 24; telephony, new method of study, Cross, Feb 7; and telegr., inventors of, Gray addr. Apr 18 *El Wld* 25 *E Mag* June 20 *Sc Am Sup* 20; first exchange, New Haven, Ct. *El Rev* Jan 2; ten years with, Barrett * Feb 20-**92**

El Wld telephony, Touanne, Sep 14-**89**, duplex, Oct 23-**86**, Jan 4-**90**, Barrett * Jan 18; submar. cables for long dist., Preece, Oct 4-**90**; disturbs., Kennelly, Apr 11-**91**; U. S. indus. June 18; Co. operating, Foote, July 9-**92**

E Mag chat with Europe, Webb, Apr -**91**; indus. future, do. Mar -**92**; teleph.-equation, Madsen, abs. *Inst C E* v 95 -**89**; effects, intensity and equality, Mercadier, abs. v 108-**92**; elec. boxes *Sc Am Sup* * Jan 21; interferences of dynamo curs., McCluer, Oct 13-**88**; telephone girl, Nelson, Feb 20-**92**

Telephone

Teck Q magneto transmitter, strength of induced cur., Cross * Feb -**89**; magneto receiver, influence of strength of magnet, do. * Nov -**90**; telephony, studies in Rogers lab. of physics, Mass. Inst. Tech., do. *Soc Arts Mass* -**89**; new method of study in, do. -**91**

ALBANY, Hudson river Co. *El Rev* * Dec 10-**92**

AM. Bell Co., report *El Eng* Apr, decis. May -**88**; reports *El Rev* Apr 7-**88**, Apr 6-**89**, Apr 5-**90**, Apr 11-**91**, Apr 9-**92**; U. S. vs., pat. decis., law (full) *El Wld* Mar 24, 31, (full) *El Rev* Mar 31, May 5 *Sci Am* Nov 24; reports, Apr 7-**88**, Apr 6-**89**, Apr 11-**91**

BELL'S water-jet transmitter, Tunzelmann *El Wld* * Aug 11 *Sc Am Sup* * Sep 8-**88**

BERESFORD, the *El Rev Lond* May 27, June 10-**92**

BOSTON exchange *El Rev* * Aug 1-**91**

COLLIER audible *El Wld* * July 18-**91**

DENVER, induction and interference with service *El Eng* Apr 16 -**90**; system *El Rev* * Feb 9-**89**

DETROIT Exchange Assoc. *El Eng* Sep 17-**90**

EDISON'S carbon pats. *El Rev* * May 14 *El Wld* * 14-**92**

GRAMOPHONE, Berliner *El Eng* * Dec 31-**90** *El Wld* * Jan 3-**91**. See also GRAMOPHONE

HOWARD'S ap. *El Rev* * Oct 31-**91**

JACQUE'S sys. of simul. telegr. and telephony *El Wld* * Nov 17-**88**

LONDON–Paris, Eng. Channel submar. line, Preece *El Rev Lond* * Aug 28; Webb *El Rev* Mar 28, Apr 11, Preece * Sep 26 *El Wld* * Oct 3; *Eng* Mar 20, Preece, Sep 4 *Sc Am Sup* * Oct 3 -**91** *El Eng*

LONG distance, 950 miles, Dickson *Cassier's* * Nov; Webb (full) *El Eng* * May 4, 11; N. Y. – Chic. line, eng. details, Wetzler * Dec 14; 1,000 miles by, N. Y. – Chic., pors. *El Rev* * Oct 29; Neilson *El Wld* July 9; *Sc Am Sup* Jan 9-**92**; *Locom* May -**88** *El Rev*

MICROPHONE, evolution of, Tanner *El Wld* * Dec 13 *El Rev Lond* * Nov 21; transmitter, excursion of electrodes, Cross, Oct 31 *Tech Q* Aug *El Rev* Nov 1-**90** *Tech Q;* Blake contact expts., Patterson *El Rev* May 5 *Tech Q* Feb -**88**; Barrett *El Rev* Mar 19-**92**; transmitter, Berliner pat. (full) *El Wld* * Nov 28, 28-**91**; cur. strength, Sabine, Cross *Tech Q* Feb -**89**. See also MICROPHONE

Telephone, NAT. Exchange Assoc. pro. *El Eng* Oct (full) *El Rev* Sep 15-**88**; *El Rev Lond* June 7-**89**; (full) *El Wld* Sep 15-**88**, Sep 21-**89**, Sep 20-**90**

NEW England Teleph. & Telegr. Co. reports *El Rev* May 18-**89**, May 17-**90**; quarters *El Wld* * Aug 1-**91**

NEW York city, service *El Eng* * Sep 10-**90**; underground wire work *El Rev* * Mar 16-**89**; Met. Exchange * Sep 13-**90**, station *Sci Am* Mar 30-**89**

PHILA. Bell Co. plant (full) *El Eng* * Feb 10, report, Apr 6 -**92**

PULSION, the *Eng* * Dec 6-**89**

ROSEBRUGH duplex system *El Wld* * Jan 4-**90**

SWEDEN & Norway *El Rev Lond* Aug 1 *Eng* Dec 12-**90**

SUTTON'S system *Sc Am Sup* * Feb 28-**91**

SWITCH-board, Vail & Seely's *El Rev* * July 14-**88**, McClure's multiple * Feb 21-**91**; switching, Wordingham, inset *Inst C E* * v 100 -**90**

UNITED Co., an. meeting *El Rev Lond* July 6-**88**, report, June 7-**89**

VAN Size's exchange system *El Wld* * Dec 8-**88**

Tele-photography, Sutton *El Rev Lond* * Nov 7-**90**

Telescope grinding machine, Common's 5-ft. mirror (full) *Eng* * Oct 28 * Nov 4, 11, inset, 18, 25-**92**

Telescopes, hand, for stadia work, Richards *Am Min* * v 20 -**92** *E & Min* * May 14 *Sc Am Sup* * June 11-**92**; object glasses *Sci Am*, *Eng* * Jan 6; for stellar photog. * Apr 27; astronom., clock driving ap. for, Grubb * Oct 5 *The Eng* Aug 10-**88**; hist., Holden *Sc Am Sup* Jan 21; Manchester exhib. * 28; great, of world, Rees, Mar 3-**88**; pyrometric * Mar 1-**90**; Lick equatorial 36-in., Keeler *The Eng* July 6-**88**

Telpherage, two rope haulage systems, Norris *Am M E* * v 12 -**91** *E & Min* * Aug 8, 15; aerial wire ropeways, Pohlig, inset (full) *Am Min* * v 19 -**91**; cable transfer for R. cars, Spilsbury * v 20 -**92**; and elec. R's of Edinb. exhib., Manville *El Rev Lond* Oct 17-**90**

El Rev elec. transport., Parcelle * Aug 9; double track elevated elec. wire road, for mining and mills *El Wld* * Jan 4-**90**; Sprague elec. aerial tramway *E & Min* * July 28-**88**; Lidgerwood suspen. cableway, Ogden mines, N. J. * Oct 10-**91**

E News the Portelectric carrier, May 25-**89**; Suspen. Transport. Co., Chandler's pat. wire ropeway * July 12-**90**; Plomo-

Telpherage
sas wire ropeway, McIntire * Mar 21 *Sc Am Sup* * Feb 21 *R Rev* the Garrucha aerial, Spain * July 25 *R & Eng* * Aug *Industries;* suspen. cableway at Austin dam, Tex. *E News* * Nov 14-**91**; long span wire rope, Howland, Me. * Apr 2 -**92**

Inst C E Gourjon system wire ropeways, Gros, abs. v 93 -**88** *An Ponts* * v 14 -**87**; Beer system, Raoult, abs. *Inst C E* v 95 -**89** *Rev Mines* v 3 -**88** *Sc Am Sup* * Dec 15-**88**; Ayrton, Perry, Jenkins', at Glynde, England, Fernald *Pop Sci* * July -**90**; wire rope transport. and transmiss. *R Gaz* * Oct 7-**92**

Sc Am Sup Otto pat. wire ropeway (full) * June 22-**89**, Gottesegen coll., Silesia, *The Eng* Dec 28-**88**, inset * Jan 25 * Feb 8, 8-**89**; Ry., elec., Edinb. exhib. * July 11 *Sc Am Sup* * Aug 30-**90**; aerial, Landun sugar works, France * June 13-**91**. See also ELEC., Portelec; ROPE driving; WIRE rope

Tempel, William, Schiaparelli *Sc Am Sup* July 13-**89**

Temperatures, at various depths, L. Cochituate, Boston, diag. *E News* * July 26-**90**; absolute zero *R Gaz* Sep 30-**92**. See also EARTH temps; THERMOMETERS

Tennessee and Ala. *Eng* * Oct 5 * Nov 2-**88**

Tesla, Nikola, por. *El Wld* * Feb 15-**90**, and his business *Sc Am Sup* * May 21-**92**

Testing machines, aut. recording ap., Gray *Am M E* v 13 -**92** *Cassier's* * Oct -**92**; the Emery, Towne *Eng* * May 11-25, 75-ton, inset * July 6, dis., insets (full) *Inst M E* * May, Oct, at Watertown arsenal *The Eng* Jan 20-**88**

Eng Kennedy's 50-ton laboratory * Sep 12 *The Eng* * July 18-**90**; hydr., 1200 tons capac., Phœnix I. Co., inset *E News* * Jan 10; the Olsen and com. report *F Inst* * Feb; alternative-center, Walker eng. lab., Liverpool, Hele-Shaw, insets *Inst M E* * July -**91**

Testing materials, uniform methods, com. report *Am C E* v 26-**92**; and sampling works, St. Louis *E & Min* * Feb 11-**88**; standard methods *E News* Mar 7, Aug 22; Kirk system, Hunt, Sept 19-**91**; Malines Gov't. works, Belgium, Roussel *Inst C E* * v 91 -**88**; metals, influence of time in, Bauschinger (full) v 107-**92**; Charlottenburg station, Germany *R & Eng* Aug -**90**; labs., Master Mech's com. report *R Gaz* June 26-**91**; repeated stress, expts., Sondericker *Tech Q* * Apr -**92**. See also BEAMS; CAST iron; MATERIALS, inspection; STEEL, expts.

Texas, geological survey *E & Min* Apr 5-**90**
Theatre, Terry, Court and Garrick, structural ironwork in, London *The Eng* * Feb 1-**89**
Thermic motor of the future *Sc Am Sup* * Apr 25-**91**
Thermo-dynamics, difficulty, Mansel cor. *The Eng* Nov 1, n 15-**89,** Bower cor. * Aug 5, Sep 23 * Dec 2-**92**
Thermograph, Draper's *Eng* * Feb 14-**90**
Thermometers, mercurial, expts. to det. rate of rise or fall, Nagle *Am M E* * v 13 -**92**; new scale, Forbes *E Wld* Oct 12-**89**; correcting *Locom* Dec -**88,** Jan; Browne (full) *Sc Am Sup* * Sep 14-**89**; calibration method at many points, Holman *Tech Q* * Sep -**87**
Thermo-motor, the Hargreaves *The Eng* Jan 27; and heat engines, R. H. Smith, Feb 3-**88**
Thomas, Edward C. G. *Inst C E* v 99 -**90**
Thomas, Sidney G., bk. review *E & Min* Aug 8-**91**
Thompson, Silvanus P., por. *El Wld* * Jan 9-**92**
Thomson, Elihu, por. (full) *El Wld* * Sep 1-**88**
Thomson, James *Sc Am Sup* July 9-**92**
Thomson, William, por. *El Eng* * Jan 13, por. *El Wld* 16-**92,** por. (full) *Sc Am Sup* * Mar 9-**89**
Thorman, Edward H. *Inst C E* v 109 -**92**
Thrashing machine trials, Doncaster *The Eng* * June 26, July 3, 10-**91**
Thurston, Robert H., por. *Cassier's* * Nov -**91**
Tide gauge, aut. self-registering, n *E News* * July 28-**88**
Tides, tidal volume, d'Auria *F Inst* * Apr, law of variation * May; range in rivers and estuaries, Gieseler, Aug -**91**; the bore of the Tsien-tang-Kiang, Moore *Inst C E* * v 99; continuous util. of tidal power, Decoeur, abs. v 102 -**90** *Genie Civil* v 17 -**90.** See also WAVE motors
Timber, expan. due to water absorption, De V. Wood *Am M E* * v 10 -**89**; preservation, ed. *Eng* Nov 21-**90**; use in eng. structures, Apr 1-**92**; mine tim. preserv. *E & Min* May 30-**91**; supply vs. R. consumption, Fernow *E News* Oct 25; preserv., Chanute, Dec 13, report (full) *R Gas* Dec 12-**90** *Sc Am Sup* Feb 14, treatment *The Eng* Sep 11, creosote for, Jan 31; Gov't. tests, J. B. Johnson, Nov 28-**91**; preserv. *E Rec* Dec 20 -**90**
Inst C E expts., want of uniform system, Campbell, abs. v 92; creosoting in New Zeal., Sharp * v 93 -**88**; in tropics, the

Timber

teredo Navalis and White ant., James, v 103 -**91**; pine, strength *R & Eng* Apr -**92**; preserv., Reed *R Gaz* Sep 19, creosoting (full) Dec 26-**90**; Am., scientific study of, J. B. Johnson * Dec 4-**91**; and some of its diseases, Ward (full) *Sc Am Sup* * Mar 17, 24 * Apr 7, 28 * May 5 * June 2 * July 28 * Sep 1, 22, 29-**88**. See also MATERIALS, strength; WOOD

Time, uniform standard, com. report *Am C E* v 26 -**92** *R Gaz* Mar 29-**89**, Jan 29-**92**; and cost, short way to keep, Binsse *Am M E* v 9 -**88**; correct, Pritchett *El Eng* July 2-**90**; elec. distrib. of, A. D. Brown *El Rev* June 30 *F Inst* June, July, (full) *Sc Am Sup* Aug 18-**88**; Mayrhofer's system *El Rev* * July 5-**90**; standard, Gov't. system, Gardner, July 30 *El Wld* July 2-**92**

E Mag old-fogy methods of reckoning, Fleming * May -**91**; standard of, 24 o'clock system *E News* * Aug 17-**89**; correct, simple method of keeping *Locom* Nov -**88**; standard and 24 hour sys. *R & Eng* May -**89**, uniform, May -**92**; convention *R Gaz* Apr 12-**89**, pro. Apr 11; new notation, Richardson *Sc Am Sup* * Jan 11-**90**. See also R's, time convention

Time checking machine, the Llewellyn *E News* * Nov 16-**89**

Tin, assay, influence of Columbite on, Carpenter *Am Min* v 17 -**89** (contin. p 785); ores, dry assay, Hofman, v 18 -**90** *Tech Q* May, Aug -**90**; alluvial deposits, Siak, Sumatra, Rolker (full) n p 772 *Am Min* * v 20 -**92**; tin and the tariff, Fletcher *Bost Traveller* Oct 3-**88**; produc., ed. *Eng* July 18-**90**; world's store, Claypole *E Mag* * Jan; tin plate indus. and English exports, n Mar -**92** *Industries*

E & Min Dakota mines, Sep 15-**88**; mines, Malinon * Aug 31; in No. Car., Ledoux cor. Dec 14-**89**; produc. Aug 30; San Jacinto mines, Cal., Benedict, Oct 18-**90**; in '89 Jan 4-**90**, in '90, Jan 3; in cen. Tex., Comstock, 24; tin plate manuf., Garrison, abs. Feb 28-**91** *F Inst* Dec -**90**; recov. from tin plate scrap, new method, Schultze, abs. *Inst C E* v 102 -**90** *E & Min* Mar 28; Bolivia mines, Minchin, May 16; U. S. tin plate indus. Dec 12-**91**; market, '91, Jan 2; ore concen. plant at Harney Peak, So. Dak. * July 30, mines do. Nov 26, Dec 3-**92**

E News Am. mines, Emmens, Nov 24-**92**; produc. *Sc Am Sup* Aug 9-**90**; sources of, Merrill, Nov 28; hist. of discov. and use of, Flower, Dec 5-**91**

Tin plate cleaning machine, Davies' *E & Min* * June 27-**91**

Tires, Munton proc. manuf. steel, Chic., inset *Eng* * Oct 17-**90**
Tobacco, use of, anal. (effect) Bosworth *Sc Am Sup* Apr 27-**89**; (effects) Rochard, Sep 10-**92** *Pop Sci*
Tools, cast iron, for cutting metals, O. Smith *Am Min* * v 19-**91**
Torey, Hamilton *Inst CE* v 98 -**89**
Tornadoes, in U.S., Hazen, notes *E News* Apr 12-**90.** See also STORMS; WIND
Torpedo boats, the Halpine *El Rev* * Oct 19; Sims-Edison fish * Nov 16; Peral submarine, Webb *El Wld* Oct 19-**89**; Fatum, Italian, inset *Eng* * Jan 20 *Sc Am Sup* * Feb 25; 2d class, Yarrow *Eng* * Apr 27-**88**; Donaldson, Feb 22; Spanish trials report, Mar 29, Apr 12, 19; seaworthiness of, Hovgaard, July 26; Ital. navy * Dec 6; Brit. navy * 20-**89**; Sunderland, b. with petrol. fuel, indic. diags. inset, * Jan 10, Mansel cor. 24, (full) *Sc Am Sup* * Feb 22; Yarrow's, Dec 20 *Eng* * Nov 21-**90**; Brazilian navy, sea-going * Sep 18-**91**
E News the 'Cushing,' trials, Jan 2; U.S. navy, inset * May 12-**92**; English *R & Eng* Feb, Mar; Nordenfelt submarine * May *The Eng* Mar 16-**88**; Ital. navy *R & Eng* * Feb -**90**; Baker submar. * July -**92**; French, No. 110 *Sc Am Sup* * May 4; No. 1, structural strength, Drake (full) * June 29 * July 6, correction, 13-**89**; Nibbio, Ital. * Feb 1-**90** *The Eng* Mar 30-**88**; standard, Sep 20-**89**; Turkish Gov't. * Jan 10; Tartar class * Nov 14, ed. 21-**90**; French * Jan 30-**91**, July 15-**92**
Torpedoes, the Howell locomotive *The Eng* Aug 17 *Eng* * Jan 20; Berdan system * Feb 3; Grenfell, ed. Apr 27; tor. attack, Jaques, Dec 21-**88**; the Victoria * Aug 29 *Sc Am Sup* * Oct 11; Whitehead & Howell aut., Ellicott *Eng* * Nov 14, 28 * Dec 19, 26-**90** *The Eng* * Aug 7-21; Sims-Edison elec. *Eng* * May 1-**91** *Sc Am Sup* * May 3-**90** * Mar 5-**92** *The Eng* * Dec 18-**91**; Canet, discharge tubes (full) *Sc Am Sup* * Sep 21-**89** *Genie Civil;* marine locom. *The Eng* Feb 24-**88**; the Lege * Apr 12-**89**
Torpedo placing machine, the Fox *R & Eng* * Feb -**92**
Torpedo thrower, aerial, Graydon air gun *Sc Am Sup* * Dec 15-**88**
Towers, Egyptian, light, Minneap. exhib. *El Eng* * Sep 17-**90**; Judson, 1600 ft. *Eng* * Nov 15-**89**; London, great, proposed, ed. May 2-**90**; iron, Frankfort Elec. exhib. * Aug 21; U.S. Columb., Chic., Morison's 1120 ft. * Nov 20 * Dec 18 *E News* * Dec 5-**91** *R & Eng* * Jan -**92** *R Gaz* * Dec 4-**91**

Towers

E News Lathing observ., N. Y., Crystal Pal. exhib., 1853, Nov 23; Douglass har., Isle of Man, Dec 7-**89**; braced iron, cor. * June 21-**90**; wind strains in, graph. det., Steiner * Mar 21; leaning, proposed, Halpenny cor. * Apr 25; Hastings proposed, Columb. exhib., cor. Aug 1-**91**

E Rec water tower, Pullman, Ill. * Dec 28; church spire framing and anchoring * Jan 12-**89**, steeple * Dec 20; London great, designs * May 17, 24, prize * July 5, Shaw's proposed * Aug 23; iron clock tower construct. * Dec 6, prize designs *R & Eng* * Aug -**90**; U. S. Columb. exhib. n *R Gas* Oct 23-**91**; tower of Babel, Kircher *Sci Am Arch ed* June -**88**

Sc Am Sup London great, proposed, designs * June 7, 1250 ft., Davey * July 19-**90**; Proctor steel, U. S. Columb. ex. * Apr 4, oscil. beam, proposed, O. Smith * May 30; Lond. Eiffel, Maxwell & Tuke design, n * Aug 8-**91** *Bld News*, *Industries*; Lond., designs, 1320 ft. *The Eng* * May 2, 1550 ft., Ende, 1300 ft., Woodcock, Fairfax * 9, 9, 1250 ft., Davey * 23 * June 6, 1400 ft., R. H. Smith report * 29, 1200 ft. Stewart (prize) * 27, 1300 ft., Webster, 2d prize design * July 4, 1300 ft., Graham * Aug 15-**90**. See also CHIMNEYS; MONUMENTS; STANDPIPES

EIFFEL Paris, 1000 ft. *El Wld* * Apr 20; copyright, ed. *Eng* Apr 12; (full) * May 3, compared with Forth br. * 3; elec. plant * June 21; lifts * July 5-19; *E & Min* * Feb 2; inset *E News* * June 8-**89**; *E Rec* * Dec 15-29-**88** * Apr 13 * May 18, 25 * June 1-**89**; pressure gauge, Nansouty, abs. *Inst C E* v 105 -**91** *Genie Civil* * v 18-**91**; lifts, Ansaloni, insets *Inst M E* * July; *R & Eng* Mar; top of *Sci Am* Mar 9; *Sc Am Sup* * Apr 27 * June 15 * July 6, 27; top of *The Eng* * Jan 4-18, hydr. elevators, Roux * Mar 22 * May 10-**89**

Towns, new (boomed), failures in, Fleming *E & Min* * Feb 13, 27, Mar 19, 26, Apr 2, 16, 30, May 21, 28-**92**

Townshend, Richard *Inst C E* v 93 -**88**

Track, railroad, expense of maintenance on wooden and metal ties, Post, dis., insets; English, Tratman, insets *Am C E* * v 18, 18 -**88**, do. and Cunningham dis. v 20 -**89**, imp., Am. development, Tratman, insets (very full) * v 22-**90**, do. Watkins, insets * v 22 *Eng* * June 10 * July 1, 22 * Aug 12 * Sep 23 * Oct 14, 21-**92** *The Eng* * Oct 17; construct. and maintenance, Hall, dis. *Am C E* * v 23 -**90**

Track

E News N. Y. Cen. standard stone ballasted road-bed * May 19; English, Tratman, July 7, Cunningham (Soc. pro.) Mar 16; the Servis tie-plates, 16, the Stuart * Apr 27; imp., Tratman * 27, July 20; track laying, cost, May 25; Dudley's inspection diags. * June 15; Goldie & Fennerty's grooved spikes, holding power * Nov 23-**89**

E News the Davies steel lock spike * Apr 19; positive nut-lock, Jeffersonville, O. * Sep 6; maintenance, Reed * Aug 30, Hall, Dec 13; Bush interlocking bolts * 20-**90**; B. & O. standards and rules * Oct 31; rail section, So. Austral. Gov't. R. * 31; spikes, tests of various forms, Cox, Dec 5-**91**

E News Young reversible nut-lock * Apr 16; Haarman (German), bk. review, July 28; protect. against torrents and earth-slides in Sicily, Italy * Sep 15; Prussian St. R's * Nov 17-**92**; German & Austria-Hungary R's per. way, W. Worthington, abs. *Inst C E* v 95 -**89**; double gauge, 3-rail turnouts for, Geddis (full) *R & Eng* * Apr - July -**92**

R Gaz car wheels, axles and, N. E. R. Club dis. Feb 17; per. way, circular returns, Apr 13; mainten. (cost), Goodwin, May 4, Curtis * Nov 16-**88**; stone ballast in India, May 3; Am., English and Indian practice, notes, Oct 11; track work, Nov 8-**89**; Jones safety nut lock, n * Oct 3-**90**; longitud. bearings for, T. C. Clarke, May 29-**91**; N. Y., New Haven standard * Jan 1; tie plates, Sandberg * Mar 25; nut locks * Nov 11-**92**. See also CROSSTIES; R's, curves — spikes — switches — U. S. construct; RAILS, joints — sections

Track jack, the Fisher duplex, n *E News* * Aug 30 *R Gaz* * Sep 5-**90**

Traction, det., h. p. of tabulated constants, Crane *El Eng* Nov 19-**90**

Traction engines, England, descr. and construct., Fletcher *E News* * Oct 27, ed. Nov 10, and steam road rollers, 10, * Dec 1 -**92**; spring wheel *The Eng* Dec 7-**88**. See also ROAD engines; STEAM carriage

Trade, England and Am. relations, McCormick, ed. *Eng* Apr 8-**92**; Am. and foreign exports and imports *E News* Apr 14-**88**

Trade-marks, law of, Sebastian, bk. review *Eng* Dec 19-**90**

Trade schools, N. Y., work in, Mead *E Mag* * Apr -**92**; J. Wilson *F Inst* Feb-Oct; N. Y. *Sc Am Sup* * Dec 20-**90**

Trade unionism, new and old, Howell, bk. rev. *Eng* May 1-**91**

Trade-winds, cause of, Velschow, dis., insets *Am C E* * v 23 -**90**

Tramways, Guinness' brewery, Georghegan *Eng* * Oct 12, insets *Inst M E* * July -**88**; the Hunt industrial *E News* * June 16 -**92**; tramway wagon with steel rails, Wells, descr. *Lehigh Eng J* Apr; steam, for country districts *The Eng* Oct 26, Nov 16-**88.** See also R's, elec; STREET R's.

Trans-Caspian territory. See R's, Trans-Caspian

Travertine deposits, Mammoth Hot Springs, Yellowstone Park, Weed *E & Min* * June 13-**91**

Trellis machine, steel *Eng* * July 25-**90**

Trench brace, Dunn extensible *E News* * July 7-**92**

Trestles, and pile structures, Western Am. R's, inset *Eng* * May 20-**92**; C. B. & N. standard plans *E News* * Apr 7, May 5, June 9; round timber, Burnt Br. creek, Vancouver, Klickitat & Yakima R., Habersham cor. * 9; Norfolk & W. stand. plans * 23; special features in wooden, cor. July 21; design of, ed. 21 -**88**

E News timber, for R's., Palmer, July 13; Cleve. & Canton frame * Nov 2; Wheeling & L. Erie timber * Dec 7-**89**; 24° curve on R., Paddock * May 10-**90**; Can. Pac. designs * May 2-**91**; pile bridges, cost of repairs, Talbot *E Rec* Sep 20-**90**; and scaffolding, Ziegler's sys., com. report *F Inst* * Aug -**88**; R. trestle work, Jameson (full) *R & Eng* * Dec -**89** * Jan -**90**

R Gaz safety of pile bridges, Apr 26-**89**; wooden bridges, Foster, Or. & Wash. Ter. R. * Apr 25, Ft. Worth & Den. City stand. * May 30, St. P. & Man. * June 13, 27 July 18 Aug 1, 22 Sep 5, 19 * Oct 31 * Nov 21, 28 * Dec 5, 12-**90** * Jan 2, 30 * Feb 13; Esquimalt & Nanaimo high * Feb 6; Minneap. & St. L. pile and, Hixon cor. * Apr 17; Intercol. R. of Can., deep water * Oct 2; Halifax har. do., pile * Dec 25-**91.** See also BRIDGES, floor-beams and pine stringers, Bates — pile; PILING; PILES

Trickett, John *Inst C E* v 95 -**89**

Trigonometer, Leschorn, diag. *E News* * Nov 24-**88**

Trigonometry, graphical, Foster *E News* * Aug 31-**89**

Triple thermic motor, Haswell *The Eng* June 1-**88.** See also THERMIC motor

Trobe-Bateman, Frederick F. *Inst C E* v 96 -**89**

Trowbridge, William P. *Am M E* v 13 -**92,** por. *E & Min* * Aug 27, por. *Sc Am Sup* * Nov 19-**92**

Trusts, and the law, C. Brown *El Eng* June 25; Am. and English, ed. *Eng* Aug 29-**90**

Tubes and tubing, rolling from solid bars *F Inst* Dec *Locom* Dec *Sc Am Sup* Dec -**90** *Am M E* v 8 -**87**; flexible metallic, Almond * v 12 -**91** *Eng* * Jan 16-**91** *E & Min* * Dec 6 *E News* * Nov 15-**90** *R Gaz* * Nov 15-**89** * Nov 28-**90** *Sc Am Sup* * Jan 10-**91** *The Eng* * Oct 18-**89** * Dec 30-**92**; spirally welded steel, Bayles *Am Min* * v 16 -**88,** v 19 -**91** *E & Min* * Apr 7, 14-**88** *E News* * Mar 30-**89** *F Inst* * Feb -**88,** abs. *R & Eng* * Mar -**89** *Sci Am* June 16-**88** *Sc Am Sup* Nov 8-**90** *Eng*

Eng flexible metallic, Cammell's * Oct 11-**89**; seamless tubes rolling, F. Siemens * Sep 21 *Sc Am Sup* * Nov 10-**88**; the Hartz tube welding machine *E & Min* * June 21; Mannesmann seamless pipe molding proc., Wedding, June 14, Dec 27, weldless, manuf. *E News* * Aug 2 *F Inst* Dec, rolling proc., Siemens *Locom* Dec -**90** * Jan -**91** *Sc Am Sup* * Mar 24 * May 12-**88,** Gordon *The Eng* June 27-**90**

E News manuf. of copper by electricity, Elmore's Aug 9-**90**; spinning, shaping and welding metals, Bevington's proc., com. report *F Inst* * Nov -**91**; spiral weld machin. development, Green, inset * Mar -**92**; manuf., Robertson cor. *The Eng* Sep 28-**88**; tube making machin., Baraclough * Oct 23-**91.** See also PIPES

Tug boats, Kathleen screw, inset *Eng* * Jan 31 *Sc Am Sup* * Mar 8-**90**; Noordzee & Oostzee screw *The Eng* * Sep 2, 9-**92**

Tunnels and tunneling, Rap. Tran. Commiss. report to Mass. Legislature, Apr 5-**92**; ventil of, Eayrs, *E Rec* Feb 28-**91,** dis., insets *Am C E* * v 23-**90**; R., covering ironwork protect. from corrosion, Dagron, dis., inset; method of alignment, Dunham, dis. * v 27, 27 -**92**; R., deep, ed. *Eng* Apr. 10; Transandine R. tunneling plant, inset * Apr 24 * May 22 *R & Eng* * June -**91**; in loose ground, Deacon *Eng* Aug 12-**92**

E Mag mod., Moir * Sep -**91**; building difficulties, Low * May -**92**; cost of tunneling at Hogsback mine, Placer Cty, Cal., Ralston *E & Min* Aug 24-**89**; submar. and Hudson river tun. * May 10; timber, Comstock Co. report, Oct 18-**90**; Reno rap. tran. system, under sts. * Feb 21-**91** *E News* * Feb 27 * Apr 21-**92,** (full) *R Gaz* * June 12-**91**

E News rock, bottom vs. top heading in, Kahnbach * Mar 24; Can. Pac. R., sections, T. Thomson * Nov 24-**88**; suba-

Tunnels

queous rap. tran., diag. * July 19; instrum. for taking cross sections in tun. excavs., Watkins * 26; temp. obs. in, Simplon projected * Nov 1; method, Great No. R., Lond. * Dec 20-**90**; subaqueous, proposed new type, Ford cor. * Apr 11-**91**; tunneling in soft ground, Jan 16, hydr. shields for, proposed, Lee cor. * Mar 19; removal, Caled. R., Scot. * Apr 21-**92**

E Rec Mil. flushing (sewer) * Dec 8-**88**; arch, shield for removing, Caled. R. * May 7; tunneling in loose ground, Vyrnwy aq., Deacon, abs. Aug 27 *The Eng* 19-**92**; ventil., three Alpine, Pürzl, abs. *Inst C E* v 106 -**91**; relining, in use, the Saulzaie, Libeaux, n *R & Eng* * July -**89**; tunneling under heavy pressures, Schenck *R Gaz* * Apr 10 * May 8; ventil. of, ed. Oct 30-**91**. See also BLASTING; EXPLOSIVES; MINES and mining; R's, underground; SEWERAGE and sewers, Brooklyn main relief; WATER-works, N. Y., Croton aq. excav., etc.

ALLEGHENY Portage R. *E News* * June 29-**89**

BALT. Belt Line, York road, inset *E News* * Jan 9 *R Gaz* * Aug 5 *St R J* * Aug -**92**

BALT. & Potomac ventil. plant *E News* * Oct 20-**92**

BETCHWORTH, Dorking, Lond. & Br. R., repairing *E News* * Apr 20, Lopes *Inst C E* * v 95 -**89**

BIG Bull, Norfolk & W. R. *E News* * June 9-**92**

BLACKWALL highway, under Thames river, Lond. *E News* * June 16-**92**

BRAYE, France *E Rec* Jan 10 *R & Eng* Jan -**91**, Laonnois, abs. *Inst C E* v 99 -**90**

CHANNEL. See TUNNELS, English Channel

CHICAGO, sewage, proposed, Nott, cost *E News* Feb 9-**89**; river, cable R., inset * Feb 22, 22 *Sc Am Sup* * Mar 22-**90**; West Chic. st., inset *Eng* * Feb 26-**92**; Wash. st. * Aug 21 *Sc Am Sup* * Sep 19-**91**, alterations in, Tresise *E News* Dec 13; water-works, inset * July 5-**90**

CLYDE river, Glasgow, proposed *Eng* * Jan 17 *E & Min* * Feb 15 *E Rec* * Mar 29 *R & Eng* * Mar *Sc Am Sup* * Mar 15-**90**

COOSA mt., Geo. Cen. R., Dabney cor. *R Gaz* * Aug 3-**88**

CROTON aqueduct, N. Y., surveying on Div. 6, Watkins, dis., insets *Am C E* * v 23 -**90**; excav. through soft ground, Carson *E & Min* * Apr 25-**91**, *The Eng* * Oct 24, 31 * Nov 7-21 -**90**

Tunnels, DULUTH, Minn., report *E Rec* Feb 21-**91**
ENGLISH Channel tubular, proposed, Reed *Eng* Aug 28-**91**; ed. *E News* Oct 25-**90**
GLASGOW, R. covered way, Glas. City and Dist., W. Wilson *E News* * Aug 25-**88**; Glas. harbor *R & Eng* * Oct -**91.** See also TUNS., Clyde
HARLEM river *E News* * Feb 18-**88**
HUDSON river *Eng* Oct 17-**90**; *E News* Oct 5-**89**; shield for * Mar 15 * July 19; segment erector * Nov 15; cast iron lining * Apr 12-**90**, ed. June 16-**92**; *R & Eng* * July; Burr *R Gaz* * Mar 14-**90**; *Industries*
IRISH Channel project, Lethbridge *Eng* Feb 20-**91**; *E News* Nov 22-**90**
KHOJAK, India *E & Min* * July 5, 19 *E News* June 28 *R & Eng* * Sep -**90**
LOCUST mt., Pa., immense mine *E News* Aug 2-**90**
LONDON, City & So. Lond., ed. *Eng* * Nov 7, 7; King's Cross * Dec 5-**90**; Islington deep, City & So. Lond. R. bill, Mar 20-**91.** See also R's, underground, Lond; TUNS., Thames
MERSEY, difficulties *E News* Sep 1-**92**
MEXICO, Valley of *E News* * Aug 10-**89**; Zumpango works * Nov 1-**90**
MILL of Ash, Caled. R. *Eng* * Mar 18-**92**
MILSEBURG, construct., Oberschutte, abs. *Inst C E* v 110 -**92**
MONT Cenis and St. Gothard, data, table *E News* Apr 13 -**89**
NEPEAN, New So. Wales, alignment of, Keele *E News* * Jan 19 -**89**, abs. *Inst C E* * v 92 -**88**
NEW York, Met. R., East river, inset *E News* * Mar 14-**91.** See also TUNS., Hudson river
NEW York & Long Is. *R Gaz* * May 9 *Sc Am Sup* * June 21 -**90**
NIAGARA Falls Power Co., Werner (full) *Cassier's* * June *E News* * Jan 9 * Dec 29 *Pwr* * Sep -**92.** See also NIAG. Falls util.
PHILA., of Balt. & O. R., construct. and cost, Thayer, inset *Am C E* * v 26 -**92**
ST. Clair, Pa., inset *Eng* * Nov 14 *E & Min* * Dec 6, and ed. (full) *R Gaz* * Sep 26, 26 *Sc Am Sup* * Aug 23-**90**; (Schuyl. Val. R.), Grand Trunk R., proposed *E News* * Jan 26-**89**; L. Huron * Oct 4; shield, inset * Nov 8, 8, 22, inset * Dec 6, hydr. mach. * 20 * 27, tools used for clay excav., eds. * 27 -**90**

Tunnels, ST. Gothard, Switz., and Mont Cenis, data, table *E News* Apr 13-**89**; air of, Bechtle, abs. *Inst C E* v 100 -**90** *Schweiz Baus* v 15 -**90**
ST. Louis water-works *E Rec* * May 7, 21-**92**
SEINE *R & Eng* * May -**91**
SEVERN, Walker, bk. n *Eng* Nov 30-**88**; Richardson *E Rec* June 4, 11, July 2-**92**
SIMPLON, Switz., projected, temps. of *E News* * Nov 1-**90**
STAMPEDE or Cascade, No. Pac. R., McHenry *E News* * June 30-**88**; Hobart * Oct 3, 10, (full) *Sc Am Sup* * Nov 7-**91**
SURAM, Trans-Caucasus R., Urquhart, inset *Eng* * Apr 5 *E News* May 11-**89**
THAMES, Blackwall, England *E Rec* * May 28, (full details), inset *The Eng* * Mar 18-**92**
VOSBURG, the *Eng* * Apr 6-**88**
VYRNWY aqued., Liverpool *Eng* * June 17, 24 *E Rec* * July 16-30-**92**; arbitration, Sep 19-**91**
WASHINGTON aqueduct *E News* May 4, 11-**89**
WEST Point, Searles, *J Assoc E Socs* Feb *R Gaz* Apr 12, abs. *Inst C E* v 96 -**89**
WICKES, Mont. Cen. R. *R Gaz* * June 22-**88**
ZIG-Zag, N. Y., Ont. & W. R. *E News* * Jan 10-**91**
ZUMPANGO works, Mex. *E News* * Nov 1-**90**
Turbines (water power), Krainische works, Assling-Sava, Carinthia, inset *The Eng* * Dec 4, insets *Eng* * Aug 28 * Sep 11-**91**; 5,000 h. p. Niag. Falls Power Co., ed., inset * Dec 23-**92**; turbine power, Freeman cor. *E News* Oct 5-**89**
Turnbull, George *Inst C E* v 97 -**89**
Turner, Barrow *Inst C E* v 94 -**88**
Turpentine, and its products, Davies *Sc Am Sup* Aug 17-**89**
Twist drill grinder, Griffith's *The Eng* July 20-**88**
Tyndall, George R. *Inst C E* v 96 -**89**
Type, relative frequency of letters and combinations *E News* July 27-**89**; casting machines, Ross *Pop Sci* Dec -**91**
Type-setting machines, composing and justifying, Lagerman *Eng* * Mar 7-**90**; Crane *E Mag* * Jan -**92**; do they hurt a trade, De Vinne *Sci Am* Apr 20-**89**. See also PRINTING machines
LINOTYPE composing, Mergenthaler's *Eng* * June 28 *E News* * Mar 25-**89** * Apr 21-**92**, com. report, insets *F Inst* * Jan -**90**; N. Y. Tribune *Sci Am* Mar 9; *The Eng* July 12-**89**
ROGER'S Typograph-*E & Min* * Dec 6-**90**

Type-setting machines, THORNE, the *E News* * Apr 9-**92**; com. report *F Inst* * May -**90**

Typewriters, Paris exhib. *Eng* Oct 4, 18-**89**; the Maskelyne * Dec 12-**90**; machs. Mar 13; the Yost * May 8; the Gardner * 29-**91**; the Hammond, com. report, inset *F Inst* * Nov -**90**; ribbons (inks), Furst *Sci Am* Nov 24; the Remington, manuf. Dec 15-**88**; the bar lock, Paris exhib. *The Eng* * May 3 -**89**

Typhoid fever, the poison of, Edson (full) *Sc Am Sup* Mar 2-**89**; specific organism of, Fuller *Tech Q* July -**91**

Uline, Andrew B. *El Rev* Apr 16, por. * 23-**92**

United Kingdom. See GREAT Britain

United States of Am., pat. office, Maynard, pors. (full) *El Rev* * Apr 16-30-**92**; indus. prog., ed. *Eng* July 5; navy, Dec 6-**89**; and Can. transport. facils., ed. May 30; coast defences, ed. June 13; McKinley tariff act, eds. Oct 10, 31-**90**; war material in, Jaques, May 22; a transatlantic congress, 29; new tariff regs. Dec 25-**91**

E Mag devel. of South, Atkinson, July; reform in pub. works, Haupt, July -**91**; our costly geolog. survey, Wolcott, Nov; indus. devel. in South, Edmonds, Oct - Dec -**92**; exports and imports, '86-7 *E & Min* Feb 18, lessons from, Aug 11; mint, need of a better, July 14, report, Dec 8-**88**, work and needs, June 1, Leech report, Nov 9, 9; Interstate commerce act (full) Apr 20, 27-**89**

E & Min (McKinley) tariff bill, abs. Apr 5, law, Nov 1; imports and exports, Aug 16; mint report, Jan 18, precious metals, Leech, bk. rev. June 21, Nov 1-**90**, coinage, Jan 10, Feb 28, Nov 14; exp. and imports, Jan 3; sil. coinage question, Carnegie, July 11, dis. 18, Oct 31 *No Am Rev* June -**91**; Southern indus. prog., Phillips *E & Min* July 9, 16; mint report, Leech, Nov 5-**92**

E News statistical abs., bk. n, debt per capita, Nov 24-**88**; naval prog. '89, Jan 12; mineral devel. Mar 23; a century of prog., pop., R's, water-works, colored inset diags, ed. * Apr 27; and Can., pop. growth, 1790 to 1880, 27; taxes, June 1-**89**; census of 1890, ed. Nov 8-**90**

E News center of pop., 1790 - 1890, map * Mar 7; pat. system, past and present, ed. Apr 18; receipts and expenditures of 100 cities, July 4; Pacific slope, growth and resources, ed.

United States
Aug 22; fuel supply of, n Dec 12-**91**; mineral stats. '91, ed. Jan 9; McKinley tariff, English views of, Farrer *Forum* Nov -**92**
F Inst Geolog. survey, broader field for Frazer, Sep -**88**; Life-saving service, Piper, Jan *Sc Am Sup* Feb 6; growth of the Federal Power, Nelson *Harper's M* July; families and dwellings, census, Wright *Pop Sci* Aug -**92**; naval prog. *R & Eng* * Jan - Mar * June * July, Sep - Nov; mineral products, Day, Sep -**88**
R Gas foreign commerce and nav., immigration and tonnage stats. to June 30-**89**, Bureau of Statistics report, Mar 28-**90**; exports of R. material, Mar 20-**91**; foreign commerce of 1891, Jan 1-**92**; census maps Boas *Science*, *Sc Am Sup* * Sep 15-**88**; navy, prog. (list) Feb 9; pop. growth in 200 years, M. C. Meigs, Sep 14-**89**
The Eng Navy, Oct 30-**91** * Jan 15, 22 * Mar 11, 18, engineers in, July 22-**92**. See also CITIES; COAL; COPPER; COUNTING ap., census; EXHIBS; FORESTS; IRON; LIFE-saving service; MINERALS; NAVIES, U. S.; PAT. system and under names of cities and states and subjects

Units and nomenclature *The Eng* Sep 25-**91**. See also ELEC—MECHAN. units

Utah, So., sulphur deposits, Faber du Faur *Am Min* v 16 -**88**

Vacuum, motors, Paris exhib. *Eng* * June 14-**89**; pan, Manlove * Dec 21 *Sc Am Sup* * Feb 4-**88**; pump, the Beacon, for exhausting incand. elec. lamps *El Eng* * Mar 4-**91**, Berrenberg's do. *El Wld* * Apr 26-**90**. See also PUMPS, vac.

Valve gears, Edward's (launch engine) *Eng* * Dec 30-**92**; Rand's mechan. air *E & Min* * Apr 12-**90**. See ENGINES—LOCOMS — PUMPING engines, valve gears

Valves, details, Nat. W-works Co., Sickels, inset *Am C E* * v 24 -**91**, and air chamber *E Rec* * Sep 19-**91**; Freeman's balanced (engine) *El Wld* * Sep 6-**90**; and hydrant manuf., Chapman V. M'f'g works *E News* * Sep 15-**88**; Rand mechan. air * May 11-**89** *E & Min* * Apr 12-**90**; 24-in. water, loss of head due to, Kuichling *E Rec* Mar 5-**92**; Lunkenheimer Brass Co. novel straightway *R Gas* * June 6-**90**. See also ENGINES, valves

Vancouver City *Eng* July 12-**89**
Van Depoele, Charles J., pors. *El Eng* * June 25-**90** *El Rev* * Mar 26-**92**
Van Zandt, Ferdinand S., por. *E & Min* * Aug 15-**91**
Vapor engines, and vapors, saturated and superheated, formulas for, properties, De V. Wood *Am M E* * v 10 -**89**, effic. of, do. * v 12 -**91**; volatile, Yarrow *Eng* Apr 6-**88**. See also HOT air engines; STEAM
Varley, Samuel A., por. (full) *El Rev Lond* Sep 9-**92**
Vawser, Robert *Inst C E* v 99 -**90**
Vehicles, draught of, cor. *The Eng* Dec 25-**91**, Brigg * Feb 26, Mar 4-**92**
Velocity, of falling bodies, in water, Richards *Am Min* * v 18 -**90**, insets *Tech Q* * May -**90**; measurement of sound *The Eng* * June 17, Aug 26-**92**
Velocity registering ap., Odograph, Marey *Sc Am Sup* * May 10 -**90**
Venezuela, vs. Great Brit., Bullman *E & Min* Mar 24; coal, asphalt and petrol. deposits *Sc Am Sup* Aug 11-**88**
Ventilation. See HEATING and ventilation
Vibrations, universality of, Haskins *Sc Am Sup* Dec 29-**88**
Vickers, George N. *Inst C E* v 96 -**89**
Victoria, New So. Wales, gold fields *Eng* * Jan 3, 17, 31, Feb 14, 21, Mar 7-**90**; colony *Sc Am Sup* * Oct 26-**89**. See also MINERALS; R's, Victoria
Vignoles, Hutton *Inst C E* v 100 -**90**
Village communities, second summers, Going *E Mag* * Apr -**91**
Vivian, Johnson, por. *E & Min* * May 2-**91**
Voice ap., Piltan's (for studying) *Sc Am Sup* * Feb 11-**88**
Volcanic eruption, Sho-Bandai-San *Sc Am Sup* Jan 12-**89**
Volta, Alessandro, Bell, por. *El Wld* * Sep 5-**91**
Vote counting, elec., Goaziou, abs. *Inst C E* v 92 -**88**
Vulcanizing press, explosion of *Locom* May -**89**

Wadsworth, Marshman E., por. *E & Min* * Nov 28-**91**
Wakeford, John *Inst C E* v 95 -**89**
Walker, Benjamin *Inst C E* v 105 *Inst M E* Apr -**91**
Walker, John, Groves, por. *Cassier's* * Oct -**92**
Walker, Thomas A. *Eng* Nov 29-**89** *Inst C E* v 100 -**90**
Walker, T. U., Mason *F Inst* Nov -**88**
Wallace, David *Inst C E* v 100 -**90**

War, mod., the civilian electrician in, Fiske *El Eng* Oct 29 *El Rev Lond* Nov 14 *El Wld* Nov 1 *E News* * Sep 20, 27 *Sc Am Sup* Sep 20, 27 *El Rev* Nov 1-**90**; electric. in, Parkhurst, Dec 17-31; war 100 years hence, Gautier *E Mag* May -**92**; art of, Mercur, bk. rev. *E & Min* Dec 28-**89**; the Kriegsspiel in Am., Livermore *Soc Arts Mass* -**90**; French disappearing turrets *The Eng* July 20-**88**; H. M. S. Blenheim * July 11; war material, Paris exhib., report * 25-**90**. See also EXPLOSIVES; GUNNERY and armor; MILITARY eng; NAVIES (war ships)

Ward, David *Inst C E* v 93 -**88**

Warden, William M. *Inst C E* v 103 -**91**

Wardlaw, James R. *Am C E* v 26 -**92**

Waring, Charles H. *Inst C E* v 91, 92 -**88**

Waring, Herbert F. *Inst C E* v 95 -**89**

Waring, Thomas *Inst C E* v 104 -**91**

Warships. See NAVIES

Washing machine, Twelvetrees' rotary *The Eng* Feb 3-**88**

Washington, D. C., st. imps. *E News* Oct 27-**88**. See also MUNIC. eng; PAVEMENTS; SEWERAGE; WATER-works, etc.

Waste forces of nature util, Preece *Sc Am Sup* June 18-**92**

Watch, compens. balance non-mag., Paillard's, Houston *F Inst* * Mar; cleaning and repairing *Sc Am Sup* Sep 22-**88**

Watchman's clock, Eco-magnetic, White *Soc Arts Mass* -**89**

Water, friction waste and loss in mains, Brush, *E Rec* July 14, dis., insets (full) *Am C E* * v 19 -**88**; flow, effect of inc. of supply to a stream, Francis, dis; supplies purity and fresh water algae, Rafter, dis., insets (very full) * v 21, 21 -**89**, abs. *Inst C E* v 101 -**90**; density at different temps., Nagle, diags. *Cassier's* * Sep *Am M E* v 13 -**92**; storage in Ariz., results, Blake; impurities of, A. Hunt *Am Min* v 17, 17 -**89**; flow through pipes *Cassier's* Nov -**91**, Airy *Eng* * Jan 4, 11-**89**, Feb 13 *E Rec* Feb 28-**91**; flowing, util. of energy of, Purdon *El Rev Lond* Aug 12-**92**

Eng charges by measure and assessment, ed. June 29, ed. *E News* July 28, 28-**88**; ground, influence upon health, Latham *Eng* Aug 28-**91**; pollution and epidemics, Rafter *E Mag* May; impure and pub. health, Davis, Dec -**91**; Passaic river, chem. and san. inves., Wurtz *E & Min* Mar 22 * Apr 12-26-**90**; tandem hoisting tanks, self-loading and dumping, for flooded slopes, Bowden * Nov 7 *Am Min*, *E News* * Oct 17 *E Rec* * 10-**91**

Water

E News evap., depth of, in U. S., map * Dec 29-**88**, Russell, Jan 5; Lond., organic matter in, com. report, Apr 6; self-recording rain gauges, value of, Weston, May 4, 4; wt. of, Dec 28; settlement, Seddon * 28-**89** * Jan 4, clearing by * Feb 1-**90**; consumpt., U. S., and use of meters, Jan 16; flow of in pipes, E. Atkinson, Apr 2; potable, micros. exam. of, Rafter, June 16; nat. aeration, Drown, Aug 25; flow over dam, formula, Frizell * Sep 29-**92**

E Rec Miss. river, Smart report, Feb 11; flow through pipes cal., Murphy, Aug 11-**88**; flow in open channels and pipes, Manning, Mar 29 *The Eng* Jan 24; rates schedules basis, Tubbs *E Rec* May 31; cost in various cities, U. S. Oct 18-**90**

F Inst Venturi tubes, new forms * Apr; potable, rapid colorimetric method of det. nitrates in, Hooker, June; compressed, dilatation of, Amagat, Sep, Dec; spheroidal state of, Gossart, Dec -**89**; water ram in pipes, Church * Apr * May -**90**; anal., local standards in, Haines, May; artes. well, anal., do. June; anal., ammonia proc. of, do. June; drinking and disease, notes, Mason * Nov -**91**

Inst C E flow, expts. with submerged ajutages, Clark, abs. v 91; Spree river, changes in passage through Berlin, Frank, abs. v 92; deep waters, penetration of light in, expts., abs. v 94 -**88**; qualities of potable, abs. v 95 -**89**; running, util., Internat. Congress, Paris, '89, Boemches, abs. v 101 -**90**; flow in earthen channels, Sadler, inset * v 103 -**91**

Sc Am Sup Hungary bitter waters, Aug 4-**88**; a glass of water (bacteria in), Kean * Apr 20 *Tech Q* * Feb; water colors, action of light on, W. Russell *Industries*, *Sc Am Sup* July 27 -**89**; molecule, Ganswindt, Oct 3-**91**; wt. of, Jan 25; surface waters (legal definition), Feb 22, Mar 1, 8-**90** *Am Law Rev*; chem. exam. of drinking, Drown *Soc Arts Mass* -**88**; chlorine in normal, Mass. State Bd. of Health map, do. -**91**

Tech Q potable, det. of nitrates in, Grandval & Lajoux's proc., Fox, Sep -**87**; surface waters, odor and color, Drown, Feb; anal., loss of ignition in, do. * Dec; biolog. exam. of, Sedgwick, Oct -**88** *Soc Arts Mass* -**90**; det. of organic nitrogen in, Kjeldahl method, Drown *Tech Q* Feb; number of bacteria in, Jordan, May -**89**, and algae, do., Sedgwick, Feb; carb. acid det. in, Hazen * May -**90**; solids det. in, do. Apr; drinking, alum in test for, E. Richards, July -**91**; difficulty with which

Water
it parts with its dissolved oxygen, Gill, Oct -**92**; supply in So. Africa *The Eng* Jan 20-**88**; induced currents, ed. * Feb 15-**89**; flow through hose and nozzles, see FIRE streams, W-wks.
AQUEDUCTS, the Nadrai, India *Eng* Oct 23 -**91**; of Zempoala, Mex. *E News* * July 7; Croton, bad work on, ed. * Oct 13, 13, McBean, cor. 20-**88**; Kali Nadi, Ganges canal failure report *E Rec* Apr 13-**89**. See also WATER-works
COMPANIES, a London, remarkable hist. *E News* Aug 17; London Co's., n Nov 2-**89**; franchises of, Jan 7-**92**; and consumers, legal relations, Denman *E Rec* Dec 31-**87**. See also under WATER-works
DISTILLING ap., Pamphlett & Ferguson's *The Eng* * Nov 8-**89**
EJECTOR, Miller *E News* * Aug 4-**88**
FILTERS, efficacy of for drinking water, bacteriolog. study, Currier, insets *Am C E* * v 24 -**91**; Hyatt system *Eng* * Nov 9, Long Branch, N. J. *E News* * Oct 13, com. report *F Inst* July -**88**; mechan. filtration, Austen *E Mag* Apr -**91**; expts., Berlin, Frankel & Piefke *E News* June 21, mechan., ed. 21-**90**
E News Nat. plant, Terre Haute, Ind. * Feb 7; filter gallery washing, Eureka, Cal. * Apr 11; the Warren * Oct 31 *The Eng* * June 19-**91**; filter bed, Raton, N. Mex., proposed *E News* Apr * 16, Holland * July 28; Lond. & N. W. R., Crewe * Sep 15-**92**; filtration practice, Tomlinson *E Rec* June 2-**88**
Inst C E filtration, prins. involved in produc. of pure water, Piefke, Berlin water-works, bk. n, abs. v 92 -**88**; softening and filtering ap. for locoms. at Penarth Dock station, Cardiff, Taff Vale R., Pullen, inset * v 97 -**89**; sand filter beds, Piefke, abs. v 102 -**90**, flow water in *An Ponts* Mar -**90**; filtration of natural waters, Drown *Sc Am Sup* Nov 1-**90** *J Assoc E Socs*; Crenothrix, Sedgwick *Soc Arts Mass* -**91**; data of, do. (full) *Tech Q* Nov -**90**; the Torrent filter *The Eng* June 8; revolving, at Dordrecht, 29-**88**. See also WATER purification
GAS. See GAS, water-gas
GATE, the Parker aut. *E News* * July 13-**89**; aut. waste-gate, Foote * June 21-**90**
INDICATORS, water-manometer and anemometer, Silliman *Am Min* * v 17 -**89**; water-level indic. and recorder, Barr & Macwhirten's elec. *Sc Am Sup* * Jan 26-**89** *The Eng* Dec 14-**88**; recorder of quan. and vel. pumped into Alexandra dock, Hull, Hurtzig * Oct 3-**90**

Water METERS, the Venturi, Merriman, dis., Herschel, inset *Am C E* * v 18 -**88** *E News* * July 7-**92** *E Rec* * Nov 10-**88** * June 25-**92**, abs. *Inst C E* v 93 -**88**; waste and loss in mains, Brush, insets *Am C E* * v 19 -**88**; proportional, adapted to measure discharge of nozzles, J. Thomson, dis., inset * v 24; the nozzle as an accurate, Freeman, dis., insets * v 24 -**91**; Schonheyder's positive *The Eng* June 15 *Eng* * 15; Tylor * Sep 21; Bonnas * Dec 7-**88**; Ahrbecker's * Jan 30; Sporton's registering * Dec 18-**91**

E News tests, Boston, Feb 25; Prov., R. I. system, Weston, Aug 11-**88**; the Frost and consumption of water per capita, Feb 9-**89**; who should own the meters, June 21; rates, U. S. and Can., table, ed. Aug 9, 16-**90**; consumpt., U. S. and use of meters, Jan 16-**92**; use of, Tubbs *E Rec* May 23-**91**; rules Madison, Wis., May 21; sale by, Berlin, June 4-30; Thomson proportional * July 30-**92**

Inst C E sale by, in Berlin, Gill, dis. (very full) * v 107 -**92**; elec. ap. for water measuring, Lowe *Soc Arts Mass* -**88**; Tylor's *The Eng* * May 3; the differential positive * May 17-**89**; the Frager * Apr 24-**91**

MOTORS, the 'Demon' *Eng* * Aug 28 *The Eng* * Oct 9-**91**; extended use of, Rodda *E News* Feb 9; and dynamo, the Belknap * June 15-**89**; cost and econ., S. Babcock, Apr 25 *E Rec* May 9-**91**. See also WATER-wheels

PIPES, flow in, Weston, dis., insets (full) *Am C E* * v 22 -**90**; loss of head through 24-in stop valve, Kuichling, insets * v 26 -**92** *E Rec* Oct 8-**92**; cast iron coated, specs., Yardley *Am Min* v 18 -**90**; cleansing, Swiney *Eng* Apr 13-**88**; corrosion, Horsfall cor. Aug 22-**90**

E News action of Boston water on, W. Nichols, Feb 25; Cal. redwood, laying * Apr 28; head in ft. nec. for different vels. of discharge, Brush, July 7-**88**, Gould * Feb 16, 23, Mar 2-23; cement-lined, Feb 16; 6-in. flex. joint * May 18; economic head for long, R. Brown * Oct 5-**89**; welded steel, making, Cartwright proc. Apr 5; cast iron, cost, Weston, tables for es. June 21, 28-**90**

E News tapping branches to, device for * Jan 24; cement-lined, wrt. iron vs. cast iron, 31; cast iron coated, specs., Yardley, com. report * Apr 18 *E Rec* May 9; riveted steel, Duncan (full) * May 9 *E News* * Apr 25 flex. joint, Liverpool * Aug 22, 5-ft., for submerged pipe * Oct 17; large siphon, McKinney

Water PIPES
lake and Miss. river * Nov 28; wooden staves mains, Hawks * June 13-**91**, Apr 28-**88**, May 12-**92**
E News bridge and 48-in main, Wash., D. C. * Feb 13; new method of laying large submerged * Mar 19, lowering submerged, Platte river, Denver * Apr 28; protection crossing bridges, S. Babcock * May 19; distrib. mains and fire service, July 21; cast iron cement joints, May 5 * Sep 8-**92**
E Rec draining and filling, Russell, Dec 24-**87**; arched main over stream, Geneva, N. Y. works * June 6; service pipes discharge, diag. and formula, Prov. * Nov 7-**91**; 4-ft., laying, Brooklyn * Nov 5-**92**; action of water on galv. iron, Nichols *J Assoc E Socs*, abs. *Inst C E* v 92 -**88**; suspended across Sarine river, Friburg, Switz., abs; cast iron, specs., com. report, abs; steel riveted, Duncan, abs. v 107, 107 -**92** *Am W W Assoc* report; 5-ft., Lavergne *Genie Civil* * v 19 -**91**; detection of leaks in, notes, Francis *The Eng* July 13-**88**; tunnel, flex. joint steel pipes, Vyrnwy to Liverpool * June 5-**91**. See also PIPES
POWER, and steam, compar. cost, Manning *Am M E* v 10 -**89**; value of a, Main v 13; prob. in, Richards v 13 -**92** *Cassier's* May -**92** *E News* Jan 24, Dec 5; elec. util. of, Buell *El Eng* Apr 8 *Sc Am Sup* May 16-**91**; Carter *El Rev Lond* * Aug 19 - * Nov 4-**92**; plant at Gokak, India *Eng* * June 8-**88**; expts. on, Aug 28-**91**; in N. Eng., S. Webber *E Mag* * July **91**; computs. worked out by slide rule, Cox *E & Min* Jan 9-**92** *Pwr* * Feb, Mar, June * July * Sep * Dec -**91**
E News of N. Jersey, Cook report, Jan 5; Holyoke, Mass. June 1; Lowell, Mass. 1; Mass. practice, Fitzgerald, May 25, June 16-**89**; Niag. River Co. * May 17, 24, Niag. Falls Co. * Nov 8; Sault Ste. Marie, July 12; elec. light station, Keswick, England, inset * Sep 13-**90**; Austin, Tex. Aug 18-**92**; hydraulics, Hiscox *Sc Am Sup* * Feb 7, 14, 28 * Mar 7, 14 * Apr 25-**91**. See also NIAG. Falls power util.
PRESSURE regulator, the Kieley *E News* * May 4-**89**
PURIFICATION, self-purif. of flowing (biolog. study) Currier, dis., insets *Am C E* * v 24 -**91**; by iron, ed. *Eng* Nov 2-**88**; revolving river purifier, W. Anderson, Aug 21-**91** *E News* Sep 22-**92**; Davis *E Mag* Mar -**92**; contam. of, in storage reservoirs on Pac. coast and palliatives *E News* * Aug 23-**90**; by metallic iron, Devonshire *E Rec* Feb 14 * *Soc Arts Mass* -**91**,

Water PURIFICATION
inset *Tech Q* * Apr -**91** *F Inst* * June -**90**; sep. of iron compounds and removal of sulphuretted hydrogen, Kaeber, abs. *Inst C E* v 92 -**88**; Leeds *Sc Am Sup* Dec 26-**91**; drinking, Austen, Oct 15-**92**. See also WATER filters

SOFTENING, plant, Southampton, inset *Eng* *Mar 11; for locoms. *E News* * June 9-**92**; Davis *Sc Am Sup* June 29-**89**; *The Eng* Feb 3, 10-**88**; Maigneu's ap., Birm. * Aug 22-**90**

SUPPLY. See WATER-works

TOWERS, Yonkers, N. Y. *E News* * May 19-**92**; the Norton, Vyrnwy aqued. * Oct 10 *The Eng* * Sep 18-**91**. See STANDPIPES

VALVES, 24-in stop, loss of head from, Kuichling, dis., insets *Am C E* * v 26 -**92**; 48-in stop, Croton aq. *E News* * Dec 15-**88**; opening indicator, Chapman Valve Co. * Dec 7, new stop valve * 21-**89**. See also VALVES

WASTE, Rochester, N. Y., restricting, Rafter, dis., insets (full) *Am C E* * v 26 -**92**; and prevention, metering and min. rates, Brush *E News* Aug 25-**88**; and charges, various cities *E Rec* Jan 11-25, Feb 1-**90**; and prevention, Hope *Inst C E* * v 110 -**92**

WHEELS, the Pelton impact motor *El Wld* * Jan 4-**90** *E & Min* * Mar 7-**91** *E News* * Feb 20, Cazin cor. * Dec 22-**92** *R & Eng* * Oct -**90** *The Eng* * Feb 27 * July 17-**91**; ancient and mod., S. Webber *E Mag* * May * June; jet *E Rec* Mar 14 -**91**; Richards *R & Eng* Sep -**92** *Am M E*

Waters, J. H. E., por. *E & Min* * Aug 22-**91**

Water-works and supply, compar. of supply systems from a finan. point of view, Fitz Gerald, dis. *Am C E* v 24 -**91** *Inst C E* v 105 -**91**, table *Sc Am Sup* July 4-**91**; gravity systems, Rafter *E Mag* * Feb; supplies for cities and towns, Davis * May -**92** *E News* treatment and sources, Fanning, Apr 28; conduits, use of salt glazed vitrified pipe in, Am. W-wks. Assoc., Babcock dis. 28; sub-surface waters for cities, Breneman, May 19; reservoir walls, proper cross-section for, Cain * June 23-**88**; of far West, ed. Apr 20; records, Diven, 27; U. S. and Can. 27, May 4-**89**, embanks. and dams, inset * June 21, for Am., ed. July 12; exam. of, Aug 16-**90**; obtaining filtered water from rivers, Lefort sys. * July 18; sources. suggestions as to selection of, Stearns, diags. * Nov 7; of U. S. & Can., ed. 28; growth, U. S., ed. Dec 5, 12-**91**; franchises, Tubbs, May 19; dissolved oxy-

Water-works
gen contained in ponds, Drown rep. Sep 29; flow of streams and storage, diags. * Oct 20-**92**
E Rec aerating nat. canals and low dams, Babcock * June 30 *Sc Am Sup* July 14-**88**; for small towns, Billings *E Rec* Mar 30; records, Glover, July 20; supply and fresh water algae, Rafter, 27, Aug 3 *Am C E*; records systems, various cor. *E Rec* Dec 21, 28-**89**, Jan 4-18; stand-pipe and trestle tower, rel. econ., Crocker, July 19; op. private Co's, account bks. Sep 6, 20, 27, Oct 25, Nov 15-**90**
E Rec devel. for small cities in west, Kiersted, Jan 24 *J Assoc E Socs*, *E News* Jan 7-**88**; stand-pipes formulas, table *E Rec* Apr 25, May 2-**91**; covered service reservoirs, Apr 30; emergency tools * May 21; bk. keeping, June 25, Aug 6-**92**
Inst C E Typhoid fever in its relation to, Mills, abs. v 107 -**92**, pph. rev., Lawrence, Mass, '91; covered reservoirs, Swan *Sc Am Sup* Oct 27, Nov 3-**88**; village supply, Terry *The Eng* Jan 20-**88**; news and notes, see *Eng News* files. See also DAMS; PIPES; RESERVOIRS; STAND-pipes; VALVES; WATER
AMERICAN Assoc. pro. *E News* Apr 28, 28-**88**, May 31, June 7-**90**, Apr 18, 25-**91**, May 19, 26-**92**, *E Rec* Apr 28, May 5-**88**, May 17-31-**89** ?, Apr 18, 25-**91**, May 21, 28-**92**
AMSTERDAM *E News* Apr 19-**90**
ASHLAND, Ky., reservoir *E News* * Apr 11-**91**
ATHENS, Ga., reservoir and dam, Ledlie *E News* * May 5-**88**
ATLANTA, Ga., W. Richards *E News* May 26-**92**
AUBURN, N. Y., suction and siphon pipe *E News* * Nov 1-**90**
AUSTRALIA, supply *The Eng* Sep 18, Oct 2-**91**
BERLIN, rules and rates, Gill *E Rec* July 9; table of consumption and sale by meter, do., dis. (very full) *Inst C E* * v 107 -**92**. See also GAS and water supply, Berlin
BIRMINGHAM, Ala., Milner *E News* * Apr 16-**92**
BIRMINGHAM, England, proposed sup. *E News* * June 20 *The Eng* * Apr 17-**91**
BOMBAY, India, sup. *E News* May 23-**91**; Hedges *E Rec* * Dec 31-**87** *The Eng*
BOSTON, Mass., Fisher hill reservoir *E News* * Mar 24-**88**; latest, n July 5-**90**; det. best capac. of basin No. 5, Nov 14-**91**; high service (full) *E Rec* * June 1-**89**
BROOKLYN, N. Y., extension, insets *E News* * Mar 7 * May 9, Milburn eng.-h. * June 6 * July 25-**91**

Water-works, BRUSSELS, sup., Gernaert, abs. *Inst C E* v 105 -**91**
BURNLEY Corp. works *The Eng* Jan 13-**88**
CARDIFF supply *The Eng* Sep 16-**92**
CHARLOTTETOWN, Prince Ed. Is., Lea rep. *E News* Apr 6-**89**
CHESTER, Pa. *E Rec* * Feb 6-**92**
CHICAGO, Ill., new, Feind, inset *E News* * July 5; submerged vs. visible intakes, Hering cor. 26-**90**; 4 mile crib, Colton *E Rec* * Oct 10-**91**
CHINA and Japan, Hart, Orange, Turner *Eng* * Feb 21 *The Eng* 21 *E News* Mar 8 Hong-Kong, Shanghai, Yokohama, dis., insets *Inst C E* * v 100 -**90**
CINCINNATI, history *E Rec* Nov 8-**90**
CLEVELAND, O., Whitelaw dis. *E Rec* Apr 28-**88**
COHASSET, Mass. *E Rec* * Dec 3-**87**
COVINGTON, Ky., Bouscaren, plans, insets *E News* * May 10, 17, 17 *E Rec* * Feb 8, 15 * Mar 1, 1, final rep., abs. *Inst C E* v 107 -**92**
CROYDEN, Addington station *The Eng* * Aug 29, Sep 5-**90**
DENVER, Col., Fortier, *E News* * Sep 22, 29-**88**
DETROIT *E Rec* * Mar 19-**92**
ENGLISH towns supply *The Eng* June 15, 22-**88**
ETON and Winsor arbitration *The Eng* Apr 13-**88**
FALL River supply case *E Rec* Mar 23-**89**
FRANKFORT-on-Main sup., Lindley *E Rec* * Dec 8, 15-**88**
FRANKLIN, N. H., covered reservoir *E News* * May 12-**92**
GENESEO, N. Y. *E Rec* * Apr 4-**91**
GENEVA, N. Y. *E Rec* * Mar 14-**91**
GENOA, Italy, supply *E Rec* * Jan 24-**91**
GOLDEN, Col., supply, n *E News* * June 27-**91**
GOUVERNEUR, N. Y. *E News* Jan 24-**91**
HAGUE, Holland *E News* Apr 6 *Eng* * Mar 15-**89**
HONG-Kong, China, Tytam, Orange *Eng* Feb 21 *The Eng* 21 *E News* Mar 8, insets *Inst C E* * v 100 -**90**
HYDE Park and Lake, tunnel and inlet crib, McLennan *E News* * Jan 12-**89**
INDIA, the Nágpur, Penny, abs. *Inst C E* v 93 -**88**, inset * v 110 -**92**
ITALIAN towns supply, Bruce *Inst C E* * v 99 -**90**
IVORYDALE, O., supply *E Rec* * Dec 26-**91** * Jan 9, 23-**92**
JANESVILLE, Wis. *E News* * July 20-**89**

Water-works, JAPAN, Yokohama, Turner *Eng* Feb 21; and China, Hart *Eng* Feb 21 *The Eng* 21 *E News* Mar 8 insets *Inst C E* * v 100-**90**

KALI Nadi aqueduct failure report *E News* May 18-**89**

KANSAS City, siphons of, Pearsons, dis. *Am C E* v 18 -**88**

LEYDEN, Holland, eng.-h. and water tower *E News* * Dec 8-**88**

LIVERPOOL, England (Lake Vyrnwy) supply *Eng* * Mar 30-**88**, inset * Feb 1-15-**89**, aqued., inset * June 17, tun. machin. * 24 -**92**; *E News* * Dec 29-**88**; ed. (full) * Aug 18-**92**; use for hydr. power *E Rec* Sep 14-**89**; Parry (full) Mar 12, 19-**92**, insets *Inst M E* * July -**91**, mechan. features, Parry, mo. power, dis., insets * Feb; Cox *Lond Graphic* * July 16 *R & Eng* * Sep -**92**; (full) *Sc Am Sup* * Mar 23-**89**; Vyrnwy aqued., Weaver nav. crossing * July 19 *The Eng* * May 23-**90**; supply * July 31-**91**, (full) * July 15-**92**

LONDON, England, supply, Bolton, bk., W. Clowes, Lond. '88; Lass, bk., W. King, Lond. *The Eng* Oct 19-**88**; Harrison *Eng* Mar 6-**91**; a London, remarkable hist. *E News* Aug 17; Lond. Co's, n. Nov 2-**89**; early sup. July 4-**92**; sup., subterranean water in chalk formation of Upper Thames, Harrison, dis., insets (full) *Inst C E* * v 105 -**91**; East London *The Eng* July 5-**89**; sup., inquiry, ed., Jan 30, Harrison, Mar 6, Dec 4, 11, 25 -**91**; Met. sup. (full) * Nov 25 * Dec 2-**92**

LOUGHBOROUGH supply *The Eng* Jan 13-**88**

MANCHESTER, England, Thirlmere, inset *Eng* * Oct 16, 30 * Nov 13, 27 * Dec 11, 25-**91** * Jan 8, insets * 22 * Feb 5; *E Rec* Mar 12-**92**

MASSACHUSETTS, supply and sewage disposal, State Bd. of Health reports *E Rec* Apr 18-**91**, abs. *Inst C E* v 93 -**88**, v 106 -**91**

MEMPHIS, Tenn. *E Rec* * Sep 12 * Dec 5, 19-**91**, Jan 2 * Feb 13, 20-**92**

MID-Sussex, Balcombe *The Eng* * Dec 9, 23-**92**

MILWAUKEE, Wis. new, L. Mich. intake of, tun. *E News* * Oct 25-**90** *E Rec* * Dec 24-**92**

MONTE-Video, Galwey *Inst C E* * v 96 -**89**

MOUND City *E Rec* * Mar 12-**92**

NAGPUR, India, Penny abs. *Inst C E* v 93 -**88**, inset * v 110 -**92**

NAPLES, Italy *E Rec* * Dec 6, 13-**90**

NASHVILLE, Tenn., reservoir, Parsons *E News* June 16-**88**; laying submerged mains * Aug 8-**91**

Water-works, NEWARK, N. J. *E News* Jan 5-**89**; map * Oct 11; sup. 11-**90** * Aug 1-15-**91**, Fteley's report, Feb 27, storage capac. of, cor. Mar 12-**92**; reservoir, E. Jer. W. Co. *E Rec* * Aug 1-29 * Sep 5, 26-**91**

NEW England, stat., tables *E News* Oct 13, 20-**88**; W-wks Assoc. pro. June 23-**88**, June 21-**90**, June 16-**92**, *E Rec* June 14, 21-**90**, June 11, 18-**92**

NEW London, Conn., supply *E Rec* Feb 13-**92**

NEWTON, Mass., covered reservoir *E Rec* * Nov 28 * Dec 12-**91**; supply, biolog. exam. of, Sedgwick *Tech Q* * Feb *Soc Arts Mass* -**88**

NEW York, supply, Croton aqued., notes on excav. of, Carson (very full) *Am Min* * v 19 -**91**, meeting of headings *E News* Jan 21; lower N. Y., Bartlett project, map * Dec 22, Croton storage, McElroy cor. 22-**88**; potable, anal. report, June 1-**89**; reservoir 'M,' inset * Mar 22; July 19; hist. and exploration for new reservoirs, Roberts, inset * Nov 22, 29-**90**

E Rec Croton aq. power op. plant, Jan 19, compressed air * Dec 28-**89**; ventil. * Jan 25-**90**; suit, July 4; N. Y.'s scant supply, Adams cor. Nov 21-**91**; aqued., eng. features and design, Chenoweth, map *F Inst* * Feb -**90**; Sodom dam *Sc Am Sup* * Jan 5; sup., Parrott * May 11-**89**; aq. * Mar 15-29, Chenoweth (full) * Apr 12-**90**; sup. *The Eng* Apr 20-**88**

OPORTO, Portugal, inset *Eng* * Feb 14-**90**

ORANGE, East, N. J., and sewerage *Sci Am* Nov 17-**88**

PARIS, France, supply, Paris exhib. *Eng* Oct 4 *E Rec* * 19-**89**; Ritter's proposed *E News* Apr 7 *The Eng* July 27; sup. Nov 23-**88**; sup. *Genie Civil* * v 16 -**90**, abs. *Inst C E* v 100 -**90**; pumping stations and reservoirs, Bechmann, abs. v 105 -**91** *An Ponts* Feb -**91**

PAWTUCKET, R. I. *E News* * June 1 *E Rec* * Jan 19, 26, Feb 9 -**89**

PEORIA, Ill., inset *E News* * July 14, 21-**92**

PHILA. supply prob. *E News* Sep 22; consumpt. '91, Oct 27-**92**; present condition, Hooker *F Inst* May - July -**89**, May -**90**

PUEBLO, Col., proposed *E News* * Jan 17-**91**

QUEENSLAND supply *E Rec* Apr 2; Joyce, inset *Inst C E* * v 107 -**92**

RACINE, Wis. *E News* * May 12-**88**

RATHMINES, Ire., Tyrrell *Eng* * Nov 9, insets *Inst M E* * Oct -**88**

Water-works, RICHMOND, Va. *E Rec* * May 23, 30-**91**
ROCHESTER, N. Y., hydraulics of Hemlock lake conduit, Rafter, inset *Am C E* * v 26 -**92**; san. protect. of water-shed, Tubbs *E News* Apr 28-**88**; *E Rec* Aug 16-**90**; * Jan 3-31 * Feb 7 -**91**
ROME, Italy, supply *E Rec* Jan 3; Hicke, abs. *Inst C E* v 104 -**91**
ROSARIO, Argent. Repub., Bruce, abs. *Inst C E* v 108 -**92**
ROTTERDAM, Port of, Strukel, abs. *Inst C E* v 93 -**88**
ST. Cloud, Minn., lowering intake pipe and crib *E News* * Apr 28-**88**
ST. Helens, Kirby pumping station *The Eng* Aug 17-**88**
ST. Louis, Mo., settling basins, inset *E News* * Apr 18; inlet tunnel and tower, inset * July 4-**91**; extension * Feb 20; *E Rec* * Apr 9, 16 * May 7, 21 * Aug 6, 13 * Sep 3, 17 * Oct 22; building * Nov 12-**92**
SCOTLAND *Eng* Aug 29-**90**
SEWICKLEY, Pa., supply and pump wells *E News* Aug 3-**89**
SHANGHAI, China, Hart *Eng* Feb 21 *The Eng* 21 *E News* Mar 8, dis., insets *Inst C E* * v 100 -**90**
SHEFFIELD, England, Eaton *Eng* * Aug 8 *The Eng* 8 *E News* Sep 20, insets *Inst M E* * July -**90**
SHREVEPORT, La., supply and sewerage *E Rec* Apr 5-**90**
SOUTHAMPTON, England, water softening plant, inset *E News* * Apr 16, Matthews, insets *Inst C E* * v 108 -**92**
STRALSUND supply, abs. *Inst C E* v 92 -**88** *Deut Viertel* -**88**
SYRACUSE, N. Y., report *E News* Feb 23; sup. sources *E Rec* Mar 16-**89**
TOKYO, Japan, supply, Nakajuna *Sc Am Sup* * Dec 29-**88**
TORONTO, Ont., Can., proposed gravity *E News* Dec 20-**90**
U. S., middle states, ed. *E News* Dec 15, 22-**88**; southern, tables, ed. Feb 9; north central ed. Mar 2, 9; of far west, ed. Apr 20; and Can., diag., ed. * 27, 27-**89**; present status of, tables, June 28, new and projected, ed. July 5-**90**; U. S. ownership of, Jan 23-**92**
VANCOUVER *Eng* Mar 15; Croes *E News* Feb 2; H. B. Smith, abs. *Inst C E* v 101 -**90** *Can Soc C E* v 3
VERSAILLES, France, supply *E News* May 2; Fanning *E Rec* May 16-**91**
VICKSBURG, Miss., settling basins, Delafield, inset *Am C E* * v 21 -**89**

Water-works, VIENNA supply, Frank, abs. *Inst C E* v 100 -**90**
WARSAW supply *E Rec* * Jan 2-**92**
WASHINGTON, D. C., supply *E Rec* Jan 30-**92**
YOKOHAMA, Japan, Turner *Eng* Feb 21 *The Eng* 21 *E News* Mar 8, insets *Inst C E* * v 100 -**90**
YONKERS, N. Y., tables, stat. *E News* Aug 30-**90**
YPSILANTI, Mich., Coats *E News* * May 10-**90**
Watson, Robert *Inst C E* v 104 -**91**
Watson, Thomas C. *Inst C E* v 103 -**91**
Watt, James, Barr *Eng* Jan 24, 31, (full) *Sc Am Sup* Apr 5-**90**
Waves, ocean, util. of power of, Stahl (full) *Am M E* * v 13 -**92,** *Cassier's* * May -**91** *E News* * June 2-**92** *Sc Am Sup* * July 2; ocean, Allingham, 2-**92**; wave power ap., Dyer * Oct 24-**91**; wave power pump *E News* Feb 18-**88**; pressure on exposed structures, ed. Sep 6, Rettig cor., ed. * Nov 15, 15; surfaces, cor. * Dec 20-**90**
E Rec wave pressure on exposed structures, Davis, Mar 5; tidal, vel. of propagation in rivers and estuaries, Gieseler, Apr 2-**92**; force of impact and stability of breakwaters, d'Auria *F Inst* Nov -**90,** Jan -**91**; propagation in liquids, new theory, do. * Dec -**90**; swell and chopping, St. Venant, abs. *Inst C E* v 94 -**88** *An Ponts* * v 15 -**88**
Waxes, resins and solid paraffins, Church (full) *Sc Am Sup* Apr 9-**92**; mineral wax, Aug 10-**89**
Weather, U. S. Bureau, Dunn *E Mag* * Sep; conditions causing cold wave, Russell * Dec -**91**; U. S., May, '88 *E News* June 23-**88**; warm winter of 1889-90, Blodget, May 3-**90**; Penn. State service, reports, see *F Inst* files; temps., U. S., table *Locom* Mar -**88**
Weatherhead, Patrick L. *Inst C E* v 92 -**88**
Weaver, John J. *F Inst* Aug -**91**
Weaving, warp and knitting, without weft, Paget *Eng* * July 19, 26-**89,** high speed * Feb 14-**90,** dis., insets *Inst M E* * July, Paget's machine (very full) *Sc Am Sup* * Aug 3, 24, 31-**89**
Weaving shed design *Iron Age* * Dec 8, dis. *Am M E* * v 13 -**92**
Webb, George W. *Inst C E* v 107 -**92**
Webb, Theodosius *Inst C E* v 100 -**90**
Weber, Wilhelm E., pors. *El Rev Lond* * July 10 *Sc Am Sup* * July 25-**91**
Webster, William *Inst C E* v 92 -**88**

Weights and measures, U. S. prototype standards of, Mendenhall *Am Min* v 18 -**90**; refinements of mod. measurements, Brashear *Eng* July 25 (full) *Sc Am Sup* Apr 5-**90**; areas, polar planimeter, setting by comput., Gieseler *E News* May 19; metric system in practical work, ed. July 7, Appleton cor. 2; standard, Gieseler * Sep 8, 15 *F Inst* * Aug -**88**; round log structures, rule to es., n *E News* May 24-**90**; foot, old Japanese * July 18-**91**

F Inst a natural scale and measure, Cooper * Feb; report *Inst C E* v 91 -**88** *J Assoc E Socs* -**87**, *Bost Soc C E*; metric system origin, Scaife *Sc Am Sup* Oct 19-**89**; internat. bureau (full) * Mar 8; U. S. standard, table, Apr 26-**90**; standards of, Bond *Soc Arts Mass* -**88**; metric system, Greenhill *The Eng* Feb 3-**88**; duodecimals, Halliday, Mar 1-**89**. See also LENGTH; MEASUREMENTS, refinements; METRIC sys; WIRE gauges

Weighbridge, 20-ton, Paris exhib. *Eng* * Sep 6-**89**

Weighing machines, Kent *F Inst* Sep -**88**; Airy, dis., insets (very full) *Inst C E* * v 108 -**92**; Aut. W. Mach. Co., legal decis. *The Eng* Dec 21-**88**

Weir, Thomas, por. *E & Min* * Mar 21-**91**

Welding, metals, Bevington's proc., com. report *F Inst* * Nov -**91**; iron and nickel, nature of, Fleitmann, abs. *Inst C E* v 96 -**89**. See ELEC. welding; IRON & nickel welding

Wells, driven and pumps for, Briggs, dis. *Am M E* v 9 -**88**; boring and sinking of, Tweddle *Eng* * Aug 31 * Oct 12, 26-**88**; and shafts sinking, Avery * Oct 16-**91**; artesian, Chamberlin *E & Min* * May 5-**88**

E News Paris, Place Herbert * June 16-**88**; of Atlanta, Ga., water, report, Jan 19; great, at St. Augustine, Fla. * Apr 6; in Dakota, 13; in N. J. July 13-**89**; of Memphis, Tenn. May 10-**90**; practice in West U. S., No. & So. Dak. * Mar 14, 28, Apr 4; yield of, sunk in permeable soils, Mancini, 21, abs. *Inst C E* v 103 -**91** *An Ponts* June -**90**; artes., the world's use of *E News* May 16; artes., Charleston, S. C., Marion sq. * Apr 4-**91**

E News artes., St. Augustine, water * Feb 20, Apr 2; artes., Galveston, Tex., deep (2920 ft.) * Aug 11; driven system, Schuyler Neb. * Sep 1-**92**; use of galv. iron for artes., Haines *F Inst* Nov *E Rec* Dec 13-**90**; artes., boring ap., Cox, Oct 31 -**91**; driven, Lowell, Mass. Dec 17-**92**; fresh water, of Atlan. beach, Frazer *F Inst* Sep -**90**

Wells

Inst C E artes., Paris, Thomas, abs, v 94 -**88**; disinfection of and on germs present in subsoil water, Fränkel, abs. v 97-**89**; artes. in So. Lincolnshire, Gill, v 101 -**90**; artes. irrig., San Bernardino Cty., Fox * v 105 -**91**; brine and gas-wells of Sze Chuen, China, Coldre, abs. v 107 -**92** *An Mines* v 19 -**91**

Sci Am deep, of Reading, Pa. Jan 19; artes., James river valley, Dak., Korns, Apr 6-**89**; artes., in Kan. and causes of flow, Hay *Sc Am Sup* * June 21-**90**; and shaft sinking, Davey * Dec 5 *The Eng* * Oct 30-**91**. See also IRRIG., Cal., So.

West Point, as seen by an Englishman *Sc Am Sup* Dec 15-**88**

Wheat grain composition and mill products *Sc Am Sup* July 11 -**91**

Wheelbarrow, history *Sc Am Sup* * Aug 23-**90**

Wheels, Cloud's boltless *R Gaz* * Mar 20; wheels linked with bell crank * Nov 21-**91**

Whipple, S., por. *E News* * Mar 24-**88**

Whistling buoy *E News* * Nov 15-**90**. See also HARBOR eng.

Whitelaw, John *Am C E* v 27 -**92**

Whitman, Thomas J. *Am C E* v 26 -**92**

Whitworth, Joseph, por. (full) *Inst C E* * v 91 -**88**

Wight, Theodore G. *Inst C E* v 94 -**88**

Wiley, William H., por. *Cassier's* * Dec -**91**

Willcox, William *Inst C E* v 100 -**90**

Willet, John *Inst C E* v 107 -**92**

Williams, John *Inst C E* v 92 -**88**

Willock, Harry B. *Inst C E* v 96 -**89**

Wilson, Arthur O. *Am C E* v 26 -**92**

Wilson, John F., por. *E & Min* * Jan 17-**91**

Wilson, George *Inst C E* v 91 -**88**

Wind, pressure, report *Eng* Mar 14, ed June 27-**90**; vel. on Eiffel tower and at Forth bridge *Sc Am Sup* July 19 *The Eng* June 13 *E News* Mar 8; the Louisville tornado * Apr 5; on cyl. surfaces, Irwin * Sep 20; and vel. measurements, Marvin, Dec 13-**90**; util. for produc. and storing of elec. energy, Vigreux, abs. *Inst C E* v 91 -**88** *Genie Civil* v 11 -**87**. See also AIR nav; BRIDGES, wind press. on; STORMS; TORNADOES; TRADE-winds

Winding engines, equaliz. of load by spiral drums, Rogers *Am Min* * v 17 -**89**; Powell-Duffryn coll., inset *Eng* * Oct 14; Reumeaux's safety gear *The Eng* Nov 11-**92**

Windlass, elec., Guyenet sys., Paris exhib. *The Eng* Sep 6-**89**
Windmill for elec. purposes, Blyth *El Rev Lond* * Aug 12-**92**; for producing elec. light, Cape de la Heve *Sc Am Sup* * Aug 3-**89**
Winslow, Arthur, por. *E & Min* * Jan 23-**92**
Windom, William, por. *E & Min* * Feb 7-**91**
Wire covering machine *Sc Am Sup* * Mar 29-**90** *Industries*
Wire gauges, Am. and European, table *El Wld* Apr 25-**91**; and plate gauges, ed. *E News* Dec 22-**92**
Wire rope, fastenings, Hewitt *E News* * Aug 4 *Am M E* v 9-**88**; haulage and applic. to mining, Roberts (full) *Am Min* * v 16 -**88**; and wire, manuf. and uses, J. B. Smith (full) *The Eng* * Mar 8, 22 * Apr 12 * May 17 * June 21, 28-**89**, bk. review *E News* Aug 29-**91**; wire ropes, Biggart, Jan 17, expts. (full) *E Rec* Apr 4-**91** *Inst C E* * v 101 -**90**; wire rope transport. and transmiss. *R Gaz* * Oct 7-**92**; flex., Gregg *Sc Am Sup* May 24-**90**, Emmerson * Jan 24-**91**. See also ROPE driving; TELPHERAGE
Wire rope-making machines, Wurin's *The Eng* * Oct 18-**89**
Wires, hysteresis in the relation of strain to stress, Ewing *Eng* Oct 11-**89**; underground, Toronto subways, Jennings, proposed *E News* * Sep 26-**91**. See also ELEC. wires, underground; TELEGR. — TELEPH. wires
Wire-working machinery, Paris exhib. *Eng* * Aug 2-**89**
Witherbee, Silas H., por. *E & Min* * June 22-**89**
Wittenberg, C. J., por. *E & Min* * Jan 31-**91**
Wood, preserv., evap. of phenols from creosoted timber, Prindle *El Wld* Mar 8-**90**; hard-wood, U. S. resources, Mohr *E Mag* Dec -**92**; silicified, Ariz. *E & Min* * Mar 24-**88**; treatment tests, Stedman *E News* * Sep 1-**88**, Prindle cor. * Feb 15; consumpt. of forest supplies by R's, Tratman report, table, Aug 30; dove-tails, holding power, Poe report * Dec 20-**90**; pine, heart and sap, compar. value, Lamb, table, Nov 30, Dec 7-**89**; forests of U. S., Putnam *Garden & Forest* Aug -**88**
Inst C E Indian woods, for eng. purposes, Lall, v 93 -**88**; Am., strength tests, J. B. Johnson *R Gaz* Aug 28-**91**; yellow pine posts, formula, diag. * Jan 29-**92**; redwood logging, Cal., Potter *Sc Am Sup* * May 24; Hemlock spruce, 24-**90**; woody fibre nature, Ihl, June 6-**91**; hard, pale, of N. So. Wales, Maiden, Dec 3-**92**. See also TIMBER — preserv.
Wood, Alfred H. *Inst C E* v 99 -**90**
Wood, Arthur H. *Am C E* v 26 -**92**

Wood, Edward W. *Inst C E* v 99 -**90**
Woodbury, Charles J. H., por. *Cassier's* * Sep -**92**
Wood fibre, vulcanized wood-pulp, Deering, abs. *Inst C E* v 92 -**88** *J Assoc E Socs;* woodite, Reed *Sc Am Sup* Mar 31; pulp manuf. in Ger. Oct 13-**88**; cellulose, Sadtler, June 4-**92.** See also LIME sulphite fiber manuf.
Woodhouse, Otway E. *Inst C E* v 91 -**88**
Wood-working, prog. in art of, Tompkins *E Mag* Nov -**92**
Wood wool machine *Sc Am Sup* * Sep 1-**88** *Industries*
Wool and fur (manuf.) W. Smith (full) *Sc Am Sup* * May 11, 18--**89**; woolen goods, causes of insufficient strength in, Feb 15 -**90**
Woolcock, Henry *Inst C E* v 110 -**92**
Workshops, econ. of health in *The Eng* Feb 3-**88**
World's, Columbian exhibition. See EXHIBITIONS, U. S. Columbian
World's industries, U. S. consuls' reports *Sci Am* Mar 30-**89**
Worthington, George, por. *El Rev* * Feb 13-**92**
Wright, Benjamin F. *Inst C E* v 94 -**88**
Wright, George H. *Inst C E* v 102 -**90**
Wright, Robert E. *Inst C E* v 94 -**88**
Wright, Thomas *Inst C E* v 104 -**91**
Wrought iron, defects in, Elbers *E & Min* July 13-**89.** See IRON
Wyld, Robert S. *Inst C E* v 104 -**91**
Wynne, Thomas *Inst C E* v 106 -**91**
Wyoming, Black Hills & Big Horn Cty., resources, Chance *Am Min* v 19-**91**

Yachts, steam, some fast, Werner *Cassier's* * Sep; coast and inland yachting, Pangborn *Century* May -**92**; internat. yacht race *Eng* * July 12-**89**; steam yacht Lady Torfrida * Aug 8-**90**; and strs. comparison, examples, A. Jones * July 3; steam, Princess Alice, 17-**91**; steam, Mira, engine and b's * Mar 18; naphtha aluminum, Mignon * Sep 9-**92**; of N. Y. harbor, Henderson *E Mag* * Mar -**92**
Sc Am Sup racing, deep keel vs. center-bd., compar. merits, Martell, Sep 8 *The Eng* Aug 3-**88**; steam, Ballin *Sc Am Sup* * Jan 10-**91**; yacht design * Jan 2-**92**; steam, Grace Darling, en. & b's *The Eng* Mar 16, 23; steam, Skeandhu and Salem, Sep 21, 21-**88**; twin-screw, 'Ormea,' inset * Apr 12-**89**; steam, Imogen, inset * Oct 3, 3; steam, Am., list, Nov 28-**90**

Yarn weighing machine, aut., Hering *F Inst* Jan -**90**
Yeast, Salamon (very full) *Sc Am Sup* * Jan 5 - Feb 23-**89**
Yellowstone Nat. Park, eng. relations of, Comstock; geolog. hist., Hague *Am Min* * v 16, 16-**88**; *Sc Am Sup* * Sep 15 -**88**; Yosemite and Alaska *Eng* * Sep 30 - Nov 25 * Dec 16, 23-**92**
Yesso, Japan, coasts and rivers of, Meik, inset *Inst C E* * v 102 -**90**
York, John O. *Inst C E* v 94 -**88**
Yosemite, Alaska and the Yellowstone *Eng* * Sep 30 - Nov 25 * Dec 16, 23-**92**
Yucatan, M'Carty *Chautauquan* Oct -**88**; the cradle of man, Ballou *Sc Am Sup* Jan 26-**89**

Zentmayer, J. *F Inst* Dec -**88**
Zinc, Rush Creek district, ark., Chance *Am Min* v 18 -**90**; produc. and prices, '87 *E & Min* Jan 7-**88,** Jan 12-**89,** U. S., '91, Jan 2-**92**; zinc-lead ores, electro-chlor. of, Slater, July 14; det. by titration, Bayley, Sep 1-**88**; Croselmire proc. Feb 9; mining in Ark. * May 11; ores, treatment of complex by smelting, Bartlett, Aug 3-**89**; desilverization expts., Edelmann, Nov 15 -**90,** Roessler, do. Apr 4, May 16; and lead mining, U. S., Kirchhoff, July 11-**91,** det. of zinc in ores, Aug 20-**92**; tensile strength of sheet *Sc Am Sup* Mar 22-**90** *Eng*
Zipernowski-Deri-Blathy, pors. *El Wld* * Apr 16-**92**
Zoology, 100 years ago, Duthiers *Sc Am Sup* Sep 14-**89**

Air navigation, power required, Maxim *Century* Oct -**91**
Aluminum, properties, A. Hunt (full) *Sc Am Sup* May 17-**90**
Chlorine industry *Sc Am Sup* * Sep 6-**90**
Cholera prevention, Sedgwick *Tech Q* Oct -**92**
Douglass, Bryce-, A. D. *Eng* Apr 10-**91**
Electric lighting station, Chic. Edison *El Wld* * Feb 23-**89**
Electric meter, the Teague *Sc Am Sup* * July 18-**91** *El Eng*
Ellipsograph, Yalden *E News* * Nov 17-**92**
Francis, James B., Mills *Tech Q* Oct -**92**
Locomotives, English express, King, diags. *R Gaz* * May 9-**90**
Railroads, Alabama Midland and Ga. So. & Fla., map *E News* * Mar 15-**90**
ALGERIAN *E News* Aug 31-**89**

... THE STANDARD. ...

The John A. White Co.

— MANUFACTURERS OF —

Standard
Wood-Working
Machinery.

DOVER, - - - N. H.

... THE STANDARD. ...

The Railroad Gazette

... IS THE ...

OLDEST, LARGEST, AND EASILY THE BEST WEEKLY RAILROAD PUBLICATION IN THE WORLD.

Its monthly and yearly record of train accidents is the standard record.

Its records of new construction, appointments, railroad news, and railroad manufacturing news are incomparably beyond all others.

Its accurate engravings of improvements in locomotives, cars, machinery, structures, bridges and permanent way contribute to making it the most complete railroad paper in the world.

The best and best known railroad officers contribute to its columns, and its editorial staff is larger and more highly paid than that of all other weekly railroad papers in America combined.

Its various books on the different departments of railroading are standard. (Book lists furnished without charge.)

It is published every Friday, at No. 73 BROADWAY, NEW YORK. The Subscription Price is $4.20 a year, and Sample Copies are free.

"A great newspaper, having the confidence of a large constituency, is made in only one way: IT GROWS."

The following figures show the growth in pages and price of ENGINEERING NEWS:

	Reading.	Advertising.	Advertising accounts open, end of each year.	Subscription.
1874	160	8	4	$2.00
1876	357	143	34	$2.12
1885	832	832	169	$5.00
1891	1,254	1,872	390	$5.00
1892	1,292	1,920	441	$5.00

"There is no forcing process for building up a circulation that can be permanently depended upon. All temporary expedients based on this principle are, sooner or later, apt to react at a loss. The first and paramount thing is to print a steadily progressive and reliable journal of such merit that, being once seen and read, it will create a demand for the next number."

The subscription list of ENGINEERING NEWS, *both for home and abroad, is growing more rapidly now than ever before in its history. It is recognized as the leading Engineering Journal of the world.*

Engineering News Publishing Co.

TRIBUNE BUILDING, NEW YORK.

Every Engineer, Civil, Mechanical or Mining, finds it more and more needful to keep track of the work of Electrical Engineers. Electricity invades every department of industry.

THE

Electrical Engineer,

QUARTO, MAGAZINE FORM, WEEKLY, AMPLY ILLUSTRATED,

Is the Oldest and the Best Electrical Journal in America.

Its contents cover, from week to week, every province of Electrical Science, Art and Industry.

It will be found an interesting and useful weekly visitor in every Engineering Office.

Subscription, ... $3.00 per Year.

ADDRESS

THE ELECTRICAL ENGINEER,

203 BROADWAY, NEW YORK.

Electrical Review,

13 Park Row, New York City.

$3.00 per Year. .. 10 Cents per Copy.

CURRENT happenings, domestic and foreign, in the Electrical and allied industries, are chronicled as **news** and not as history.

Every live, wide-awake engineer should be a subscriber to the

Electrical Review.

The Best Advertising Medium.

THE PIONEER ELECTRICAL JOURNAL OF AMERICA.

Read Wherever the English Language is Spoken.

THE ELECTRICAL WORLD is the largest, most handsomely illustrated and widest circulated electrical journal in the world. No other technical journal published approaches it in its expenditures for articles and illustrations for its reading columns. Among the contributors are numbered the most eminent electricians of the world, its articles being cosmopolitan in character, and written in clear and simple language, devoid of unnecessary technicalities.

AT THE COLUMBIAN WORLD'S FAIR, THE ELECTRICAL WORLD has a complete editorial staff and its own artist constantly on the ground. Its World's Fair articles furnish an unrivaled account of the electrical features of the Fair, not only for present reading but for future reference.

FIFTY-TWO TO EIGHTY PAGES A WEEK. Handsomely illustrated. Subscription, including U. S., Canada, or Mexican postage, **$3.00** a year. Of newsdealers, **10 cents** a copy. Sample copies free.

Books on Electrical Subjects.

THERE IS no work in any way relating to electricity that we do not either publish or sell. Books promptly mailed to any address, postage prepaid, on receipt of the price. Catalogues and information free. Address

THE ELECTRICAL WORLD,

41 PARK ROW, :: :: :: :: NEW YORK.

THE ENGINEERING RECORD

BUILDING RECORD AND THE SANITARY ENGINEER

A JOURNAL FOR ENGINEER · ARCHITECT · CONTRACTOR · MECHANIC & MUNICIPAL OFFICER

[Founded in 1877] and prior to 1887 known as *The Sanitary Engineer*, is the recognized authority on Municipal and Building Engineering. It has subscribers in all countries where there are engineers who can read English. In 1892 it was enlarged by the addition of a department conducted, as is its custom, under the advice of an expert, in which notable industrial plants are regularly described and illustrated, the steam and power plants being a conspicuous feature.

> "The success of this publication has been marked in many ways; not only has it become a source of profit to its projector but it has been of incalculable value to the general public whose interests it has always served."—*Cincinnati Gazette.*

> "It stands as a fine example of clean and able journalism."—*Railroad Gazette.*

It is published every Saturday, $5 to United States and Canada, $6 to other countries. Sample copies and list of its publications free. Address

277 PEARL STREET, NEW YORK.

Contractors for Municipal and Government Work and Manufacturers of Engineering and Building Supplies will find every week in the Proposal Advertisements and Contracting News columns of THE ENGINEERING RECORD *important items indicating the wants of U. S. Government, Municipal Authorities, Water Companies, and Building Committees of Public Buildings. Information will be found there each week not elsewhere published.*

PATENTS!

MESSRS. MUNN & CO., in connection with the publication of the SCIENTIFIC AMERICAN, continue to examine improvements, and to act as Solicitors of Patents for Inventors.

In this line of business they have had *forty-five years' experience*, and now have *unequaled facilities* for the preparation of Patent Drawings, Specifications, and the prosecution of Applications for Patents in the United States, Canada, and Foreign Countries. Messrs. Munn & Co. also attend to the preparation of Caveats, Copyrights for Books, Labels, Reissues, Assignments, and Reports on Infringements of Patents. All business intrusted to them is done with special care and promptness, on very reasonable terms.

A pamphlet sent free of charge, on application, containing full information about Patents and how to procure them; directions concerning Labels, Copyrights, Designs, Patents, Appeals, Reissues, Infringements, Assignments, Rejected Cases. Hints on the sale of Patents, etc.

We also send, *free of charge*, a Synopsis of Foreign Patent Laws, showing the cost and method of securing Patents in all the principal countries of the world.

MUNN & CO., Solicitors of Patents,
361 Broadway, New York.

BRANCH OFFICES.—No. 622 and 624 F Street, Pacific Building near 7th Street, Washington, D. C.

The Pioneer Street Railway Paper of the World!

THE STREET RAILWAY JOURNAL

FULLY ILLUSTRATED.

ESTABLISHED 1884. PUBLISHED MONTHLY. INCORPORATED 1891.

THE STREET RAILWAY JOURNAL is eminently a practical publication, but presents sufficient scientific and technical knowledge relating to the subject to make it a favorite with engineers as well as with street railway managers, employees, promoters, advertisers and all interested in this particular industry.

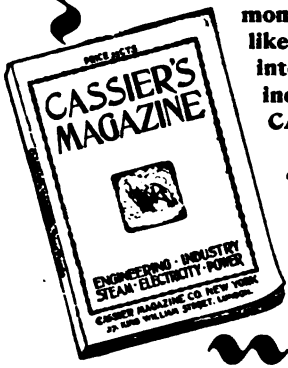
The regular issues of the STREET RAILWAY JOURNAL contain matters that make it (1) a manual of practice both for construction and operation; (2) an embodiment of advanced mechanical, electrical and scientific thought; (3) a record of the latest practical inventions and appliances, methods and statistics that relate to this field; (4) a directory of manufacturers and dealers in street railway materials, as well as a directory of all roads in operation in the United States and Canada.

Subscription $4.00 per year. Foreign countries, $6.00. Postage prepaid. Addresses changed as often as desired. Address, STREET RAILWAY PUBLISHING COMPANY,

World Building, New York. 537 The Rookery, Chicago, Ill.

For 25 Cents,

If you mention this Advertisement, we will send you the last two copies of CASSIER'S MAGAZINE, the great engineering and electrical monthly. (Regular price, 50 cents.) Just like Harper's and the Century. No one interested in engineering, electrical or industrial subjects should fail to read CASSIER'S MAGAZINE.



BOSTON DAILY HERALD.

"Truly first-class, and the illustrations are exceedingly fine."

NEW YORK WORLD.

"Well edited, printed and illustrated."

164 Pages Monthly. $3.00 per Year. 25c. a Copy.

CASSIER MAGAZINE CO., NEW YORK CITY.

THE

AMERICAN ENGINEER AND RAILROAD JOURNAL.

(Formerly the RAILROAD AND ENGINEERING JOURNAL.)

Is a monthly illustrated publication, edited and owned by M. N. FORNEY, and is devoted to **Mechanical Engineering, Railroad Topics and Interests.** As the most important branches of engineering in this country are those relating to railroads, it follows naturally that in a publication like the AMERICAN ENGINEER, more space is devoted to the design, construction and operation of Locomotives, Cars, Signals, Bridges, Permanent-Way, etc., than to any other one class of subjects, but due attention is given to such topics as Shop Practice, Tools, Machinery, Stationary and Marine Engineering, Naval Progress, Ordnance, Aeronautics, New Inventions, New Publications, Proceedings of Engineering Societies, Condensed Notes and News, etc.

The general scope of the paper embraces a somewhat wider field of Engineering than most of the technical papers in this country do which are devoted to some special department of mechanics or manufacture, and therefore it is a very attractive publication to all who aim to keep themselves informed in relation to what is going on in the mechanical and engineering world. Your subscription is solicited.

PRICE, 25 CENTS EACH. .. .. $3.00 PER YEAR.

Address M. N. FORNEY,

47 CEDAR STREET. ∴ ∴ NEW YORK CITY.

THE MARDEN

Smokeless Boiler.

Down Draft, Return Tubular.

FOR STEAM POWER, HEATING AND ELECTRIC RAILWAY AND MILL PLANTS.

SMOKELESS,
ECONOMICAL,
STRONG and SIMPLE CONSTRUCTION.

No Brick Casing or Grate Bars Required.

Send for Circulars and Information to

The Marden Smokeless Boiler Co.

O. E. LEWIS, *President.*

No. 298 Devonshire Street, Boston, Mass.

EDWARD S. SHAW,

BRIDGE AND CONSULTING ENGINEER,

12 PEARL STREET, BOSTON, MASS.

SPECIALTIES: — Bridges and Roofs, Structural Ironwork, Masonry and Foundations, Building Construction.

Designs, Drawings, Specifications and Estimates. Examinations and Reports.
Supervision of Construction.

POWER

Devoted exclusively to the economic generation and transmission of power.
A handsomely Illustrated Monthly. **$1.00 a Year.** Sample copy on application.

PUBLISHED BY **THE POWER PUBLISHING CO.,**
Rooms 145 & 146 World Building, : : New York, N. Y.